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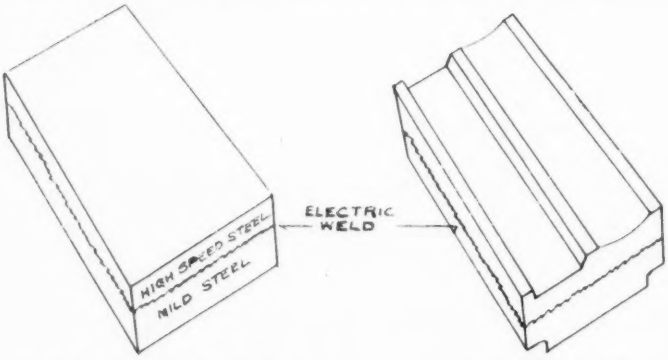

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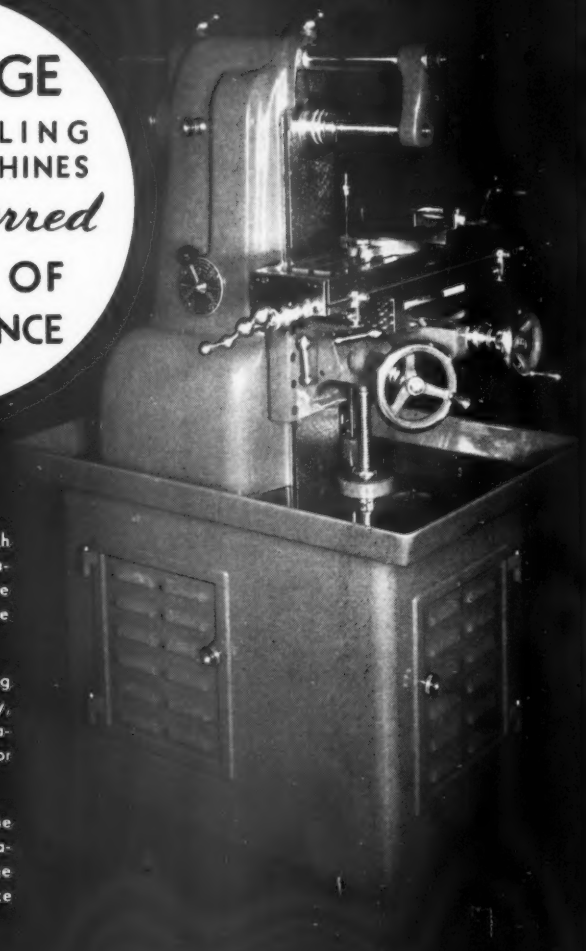

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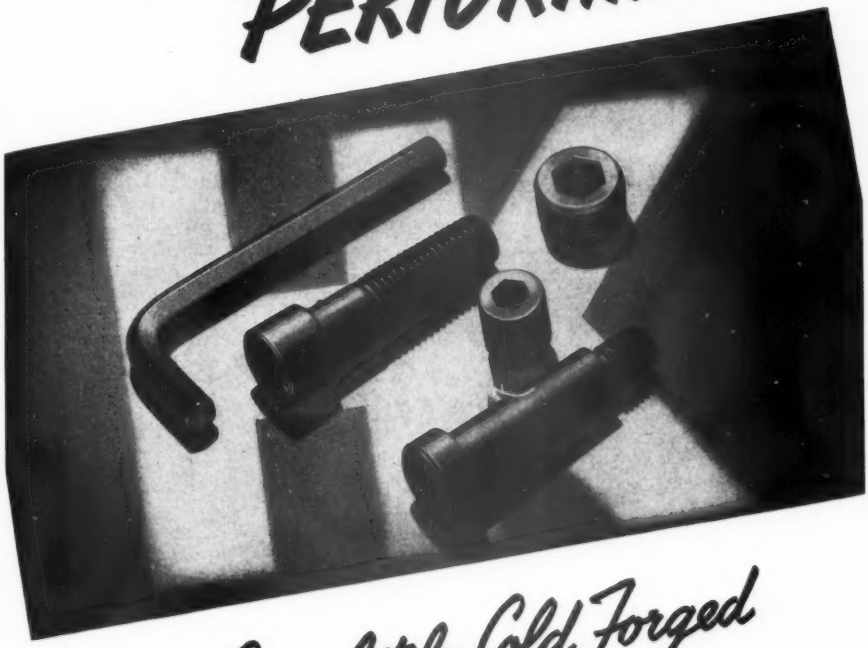

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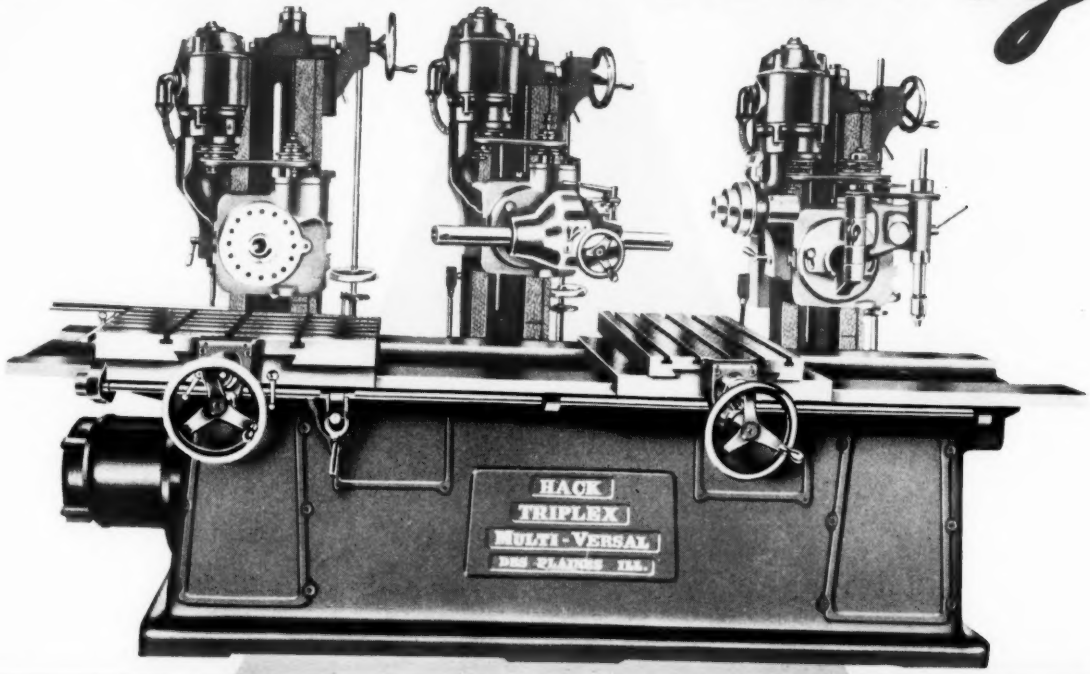

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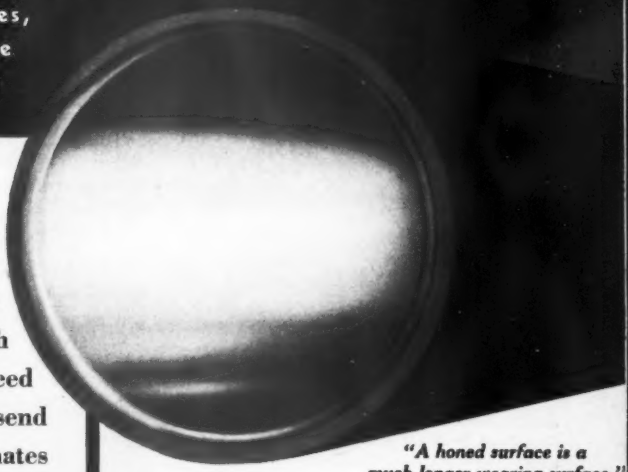

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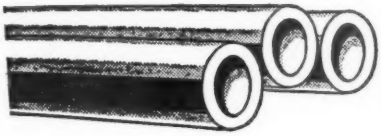

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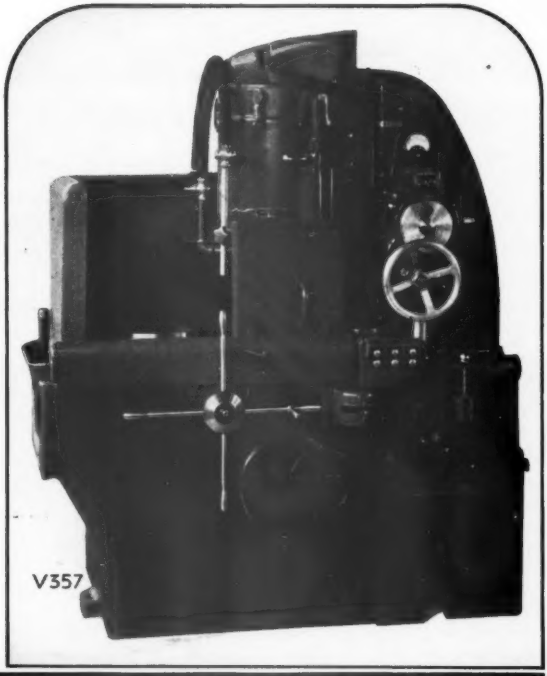

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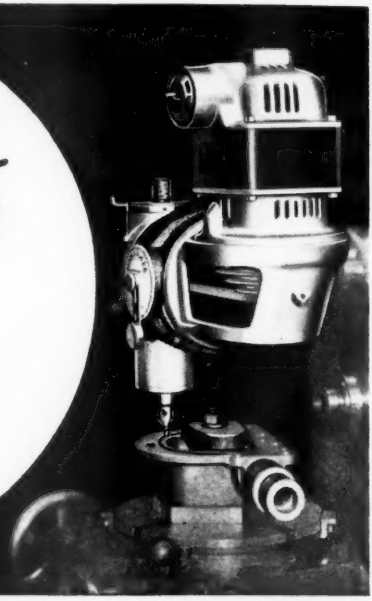

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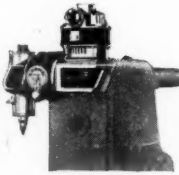

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The TOOL and DIE Journal

TOOL–DIE–MACHINE PROGRESS

AUGUST, 1941 Vol. 7, No. 5

HONING:

Economical Stock Removal plus Surface Finish

By Lysle L. Hazen, Engineer

Enterprise Machine Parts Corporation

HONING is a comparatively new machining operation which is claiming attention today because it can replace two important operations which are in great demand and for which there is a shortage of facilities.

Honing, in fact, has six accomplishments to its credit: 1. It removes substantial amounts of stock. 2. It makes finish boring unnecessary. 3. It generates size. 4. It generates accuracy for roundness and straightness. 5. It makes certain grinding operations unnecessary. 6. It produces the desired degree of surface smoothness. It should not, however, be thought of as generating alignment as related to squareness, concentricity or parallelism of axes in adjacent bores.

Surface finishing has always provided industry with important and interesting problems of processing although most of the methods for removing stock have been well-known to manufacturers, engineers, tool makers and machinists.

Originally, "production grinding by the honing or multiple stick method was developed for finishing automobile engine bores, and has been universally adopted there."* In the years since then, honing the wearing surfaces of mechanisms of many kinds has enabled manufacturers to guarantee long, trouble-free operation of their products and devices. Household refrigerators with their electrically driven units operating for years without service do so because honed wearing surfaces can be so perfectly fitted. Materials which are being successfully honed include all types of alloyed steels with degrees of hardness from soft to brittle hard, non-ferrous metals and cast iron.

However, it is a fact that, until quite recently, the smoothness of surface finish after stock removal has remained about where it was when automobile speeds were 30 to 40 miles per hour and 100 miles per hour was considered fast for an airplane. But today automobiles are made to travel at 80 and planes at 300 and 400 miles per hour and one of the truly important research discoveries that has made this possible is the part

*A Presentation on Production Grinding, published by Carborundum Co., in 1935.

played by smoothness of surface finishes.

Fig. 1

High speed steel castings, Rockwell 68-70, were honed to a depth of 18 inches to a finished dimension of 3.771 inches. The average stock removal was .025 inch.

Metallurgists have given us ever better qualities of metal alloys and it is logical, therefore, that engineers would develop a more perfect method of finishing the surfaces of those metals. Tools, abrasives and machines for all of the different processes have been improved. Surface finish specifications, however, continued always to move ahead until they demanded almost the complete elimination even of scratches. This ultimate honing achievement is claimed of Superfinish, developed by Chrysler Research Engineers. In 1938 it was hailed as the outstanding industrial development of the year, producing surfaces on engine crankshafts to the point where they are flawless to within six one-millionths of an inch.

In view of these achievements and the publicity which has resulted, it is natural, perhaps, that surveys made recently by one builder of honing machines revealed that many manufacturing executives and their key men still think of honing as a machining process merely for removing a few ten-thousandths of an inch of metal to assure a finer surface finish. There could be no greater misconception of the true value of honing.

In the several years after its development and during which the Empco Horizontal Honing Machine was being tested in contract service, numerous processing problems with greatly varying specifications and requirements were encountered and solved successfully. The most important to Industry today are those which proved honing to be a stock-removal process more effective and more economical than internal grinding. Two case histories will illustrate:

The 10 high speed steel castings in Fig. 1 tested Rockwell 68-70. The internal surface was honed to a depth of 18 inches. The finished dimension was 3.771 inches. The actual record for each casting was as follows:

	Stock Removed	Time Required
No. 1 Set-up and experimental ..	.026 inch	26 hours
No. 2	.013	7
No. 3	.025	9½
No. 4	.028	9
No. 5	.028	8
No. 6	.030	11
No. 7	.030	7
No. 8	.028	9
No. 9	.023	7½
No. 10	.025	7
TOTALS ...	.256 inch	101 hours

No other method for doing this job in the time shown is known to the writer.

It was reported that internal grinding had been tried but that time and cost were prohibitive, whereas honing accomplished the job in a fraction of the time. This is even more remarkable when it is remembered that the material was *high speed steel*, that the average amount of stock removed was .025 inch and that the internal finish dimension was perfectly attained in every casting.

Granted that this was an exceptional job, here is one considered average; although by most shop men it will be looked upon as considerably more than satisfactory. Stock removal from the 10 pieces of alloy steel tubing shown in Fig. 2, which tested Rockwell 36, was at the rate of .001 inch per minute per surface foot.

It should be borne in mind also that the only additional requirement for developing a micro-finish inside both the castings and the tubes described, is the change to finishing stones.

It is common practice today to process parts as follows:

Rough-bore; semi-finish bore; heat treat; grind to correct distortion resulting from hardening; rough-hone and finish-hone—a total of five *machining* operations.

Modern Honing Eliminates Two Machining Operations

The more modern method, however, and one which is coming more and more into use, reduces the processing to three machining operations, thus:

Rough-bore; heat treat; rough-hone; and finish-hone when near perfect smoothness is required.

Note the ommission of the semi-finish boring operation and the grinding for correction of heat treat distortion. This is possible with the newest type of horizontal honing machine, which assures not only a low degree of surface roughness, but also practically no deformation of surface structure.

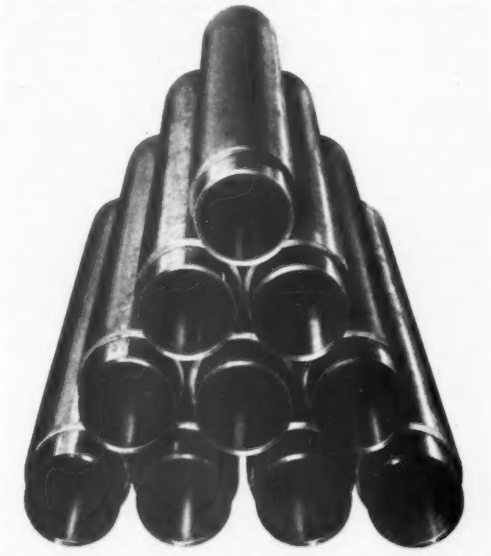


Fig. 2

Alloy steel tubing, Rockwell 36, from which stock was removed at the rate of .001 inch per minute per surface foot. This rate of removal is an sound average for setting the speed of a honing tool.

Because of the frequent and severe shortages of vital machining facilities in today's Defense emergency, any process which will reduce machining time or which will eliminate one or more of the series of operations which must be applied to parts production is an economic factor to be given earnest consideration.

Another example of the effectiveness of honing in eliminating other important types of machining is that of honing cold drawn steel tubing. Stock is removed, the required finish is attained and at the same time diametrical roundness and straightness as well as axial

(Continued on Page 43)

Designing Dies to Reduce Production Costs

By George Dannes

This is the first part of a two-part article detailing the design and time value estimates for a set of dies required for the stamping press operations to make a section of the upper control arm of a well-known motor car. The flange and finish extrude dies are treated in part one. The first form and extrude dies and the pierce and blank die, completing the set of dies required, will be described in an early issue.
—The Editor.

Design

IN Figs. 1 and 2 we have working drawings of the same part, a section of the upper control arm for the front wheel of a well-known motor car. In Fig. 1 the part is shown as a stamping and in Fig. 2 as a forging. The manufacturer, who formerly made the part as two forgings, now makes the part as a stamping.

The part shown in Fig. 1 is somewhat out of the common run of stampings, but is a very good example of modern engineering design. It was designed out of necessity because the cost of two forgings was considered out of line in quantity production cost. There was a saving alone in weight of material that was considerable. However, the principal saving in production cost came from the simpler processing required in the stamping operations.

The part as originally developed came from two forgings which had to be cut from bar stock heated to red heat and brought to shape in a number of swaging operations in dies under a drop hammer, each piece requiring individual dies and attention. Examination of Fig. 1 indicates that strength of this part has not been sacrificed, but actually increased in comparison to the round section of the forging (Fig. 2). Section B-B, Fig. 1, shows a perfect condition for moment in any direction, while the rest of the stamping is a substantially sound channel structure with an ample load safety factor. Another factor in the switch-over to stamping operations was the scarcity of forging facilities. The forging shops are and have been for some time overloaded. The greater number of tool rooms and die shops that could build stamping dies was also considered. The tool room of the manufacturer in question was able to do both the designing and building of the stamping dies in this case.

The tooling cost for stamping has also been reduced, since one blanking die can produce both right and left hand parts because the parts are symmetrical, except for opposite hands. With all these factors considered, it was judged sound business to make the change to stamping operations.

Stamping press operations would be as follows:

1. Pierce and blank (left hand and right hand in the same die).
2. First form and extrude (one die for left hand; one die for right hand).
3. Flange, restrike and finish extrude (one die for left hand; one die for right hand).

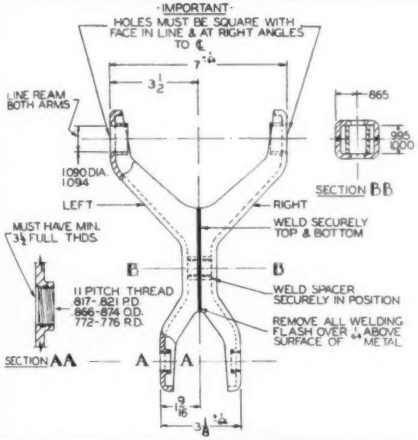
In addition to the principal press operations, there are also machining operations and welding, as for example welding the left hand and right hand members together; line reaming two holes on the wide fork; welding the spacer on the center hole; and finally, tapping the

holes on the narrow fork.

There is a limit of .005" on the inside of the metal after welding right hand and left hand parts together (Section B-B, Fig. 1).

This indicates or suggests that the blank should be developed rather short or undersize to assure sufficient clearance between the right hand and left hand members so that when they are placed in the welding fixture they will not come together. The weld itself should fill the space. It is obvious that the welding fixture is a very important tool in fabricating this piece.

parts it should be run in a press capable of this production. The stock thickness of the part is quite heavy and strip stock would have to be used. The pierce and blanking die designed would produce about two and one-half to three times as many blanks as the succeeding forming operations. This would mean that the blanking die would keep up with the production of the forming dies. This is important since it reduces the storage space required at or near the presses and helps assure an even, uninterrupted flow of production. To actually produce this part requires five dies as indicated above.



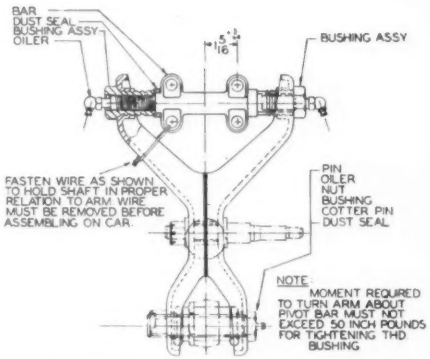


Fig. 1, Left—The part as a stamping
Fig. 2, Right—The part as a forging

When a part such as this reaches the processing department in a large plant or the estimator in the small shop, the part is subject to the same analysis in either case:

1. How should the operations be divided?
2. The production runs involved (this determines the quality of the tools to be built).
3. The establishment of the cost of the finished piece.

This must be computed from the cost of the tools; the production per hour with each die and other fixed production cost factors.

The processing for stamping operations would be somewhat like the following:

Since the blanking die has to produce blanks for both left hand and right hand

Starting with the first operation we find that this die is a rather difficult one to build. We have a finished part and we know just about how much material to allow for each bend. However, that is a problem in itself because no formula has been developed which gives the die engineer the exact amount of material that is necessary to complete a certain form. A number of factors have to be taken into consideration. Perhaps the most important is the variation in the thickness of stock. Mill tolerances are generally held to plus or minus .005". Prime stock can be called for at a premium price but the cost is usually prohibitive for production work.

Proceeding to design the die for this part, we follow the general rule with most formed parts—namely that the dies will have to be built in a reverse order.

The forming dies are designed first since they can be built to the dimensions of the print except for gages which are put on the dies after the blank has been developed and the exact position for locating the blank has been determined. Also, the forming dies are the only means the die maker has for a correct development of the blank. Trial blanks will have to be cut out by hand and after forming in the forming dies the correct outline of the blank must be established by trial and error.

sions and approximate figures as shut-height of press and general size and construction of the dies. It will be noted that air pressure is used on both dies instead of springs. This has been done to obtain a firmer hold on the blank during forming operations.

We begin with the flange and finish extrude die since it is to be built first. As shown in Figs. 4 and 5 it consists of four die sections which are sunk in the die shoe to prevent the die from opening and to allow for shimming when neces-

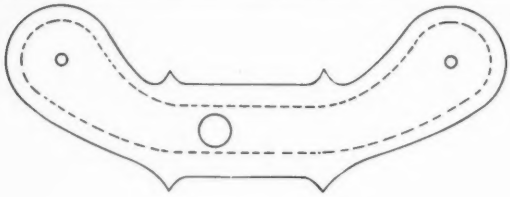
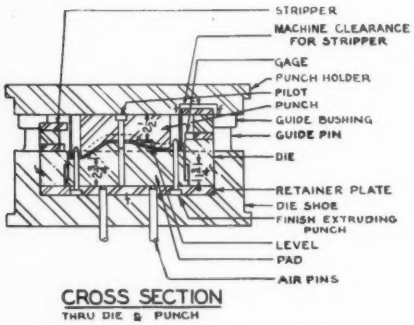


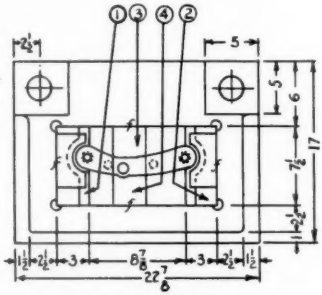
Fig. 3, Left—An estimated blank

Fig. 4, Below right—Plan of die and plan of punch

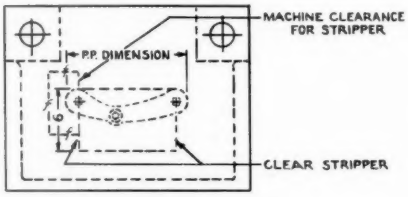
Fig. 5, Below left—Cross section through the flange and finish extrude die



CROSS SECTION
THRU DIE & PUNCH



PLAN OF DIE



PLAN OF PUNCH

NOTE: The unusual length of this article has made it necessary to omit the Die Work Estimating Sheet. However, a copy of this Sheet will be sent upon request to the office of this publication. — *Editor.*

Fig. 3 shows an estimated blank such as the designer would develop on paper so that material for the die can be ordered and the size of the press, die, shoe, etc., established. Figs. 4 and 5 show sections through the flange and finish extrude dies, illustrating minimum dimensions due to wear. The retainer plate which holds the extruding punches is also sunk in the shoe. The pad travels inside the die sections and is air actuated. The gage blocks and stripper fingers are mounted on top of the right

(Continued on Page 24)

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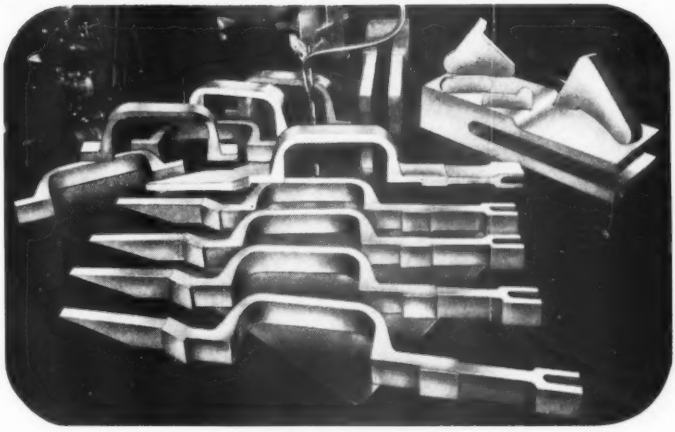

Taylor-Wilson Mfg. Co., McKees Rocks, Pa., had an important defense contract calling for forgings for large parts in the foreground. Dies would have cost lots of money. Making them by hand would have been slow and very expensive. The DoAll made the parts in 16 hours and this firm calculates that the saving was $600.

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Designing Dies to Reduce Production Costs

(Continued from Page 22)

and left side die blocks. This completes the lower part of the die.

The punch holder mounts the punch which is of Type 2 construction and contains the pilot. Some shops prefer the pilot in the pad but faster production can usually be secured when the pilot is on top, since the piece part does not have to be picked from the pin, but can readily be kicked through the back of the die. To keep the die within its shut height limit a pocket is milled in the punch holder casting to clear the stripper finger on the high side of the die.

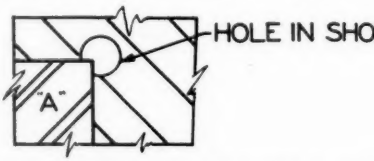
The die sections, pad and punch follow the preformed contour of the blank. As the punch descends the blank is carried in the cavity and the flanges are whipped up. At the same time the extruding punches enter the preformed holes and size them. On the upstroke of the press the blank is carried out of the die, hugging the punch until it is forced off by the two stripper fingers. The punch and pad are made of oil hardening tool steel castings, since this will save much time compared with machining the contours out of a solid piece of steel. The four die blocks are oil hardening tool steel bar stock.

The gages and stripper fingers are made from water hardening tool steel because there is considerable wear during the production run. All other parts are made from cold rolled steel with the exception of the punches and pilot which are made from a high quality oil hardening drill rod.

First Fit Die Sections Together

In building this die, the first step is to fit the four die block sections together. After this we lay out the contour of the outside dimensions of the blank on the four sections. Also, laid out at this time is the contour line (the varying height of the blank), keeping in mind that the center portion of the blank stays level. After machining the die blocks to those lines by either sawing or milling the blocks are ready to be hardened. Just enough stock is left to allow for grinding all over after hardening. After grinding the contours to the exact size the four sections are set up together so as to form the exact die opening according to print.

Outside dimensions over the four die blocks are now taken, giving the size of the pocket to be milled in the die shoe to admit the blocks. This pocket is laid out on the die shoe and four good size holes are drilled on the four corners of its outline. This is to admit the sharp corners of the die sections, as illustrated.



After this is done the pocket is milled to the desired depth and finished. The retainer plate is also squared to the dimensions of the pocket but undersize to assure easy removal in case of punch breakage. The retainer plate is next screwed and doweled in place, the four die sections are placed in the pocket, screw and dowel holes in the die sections are transferred to the retainer plate. Dowel and screw holes are then drilled through the retainer plate and die shoe. Screw holes are tapped and dowel holes are reamed. This assures the correct location of each die block section, regardless of how often the die has to be reassembled. The pad is machined (milled) to its correct contour and fitted in the preassembled die opening, until a good slip fit is obtained.

Stock is left on the bottom to form the keeper, i.e., the shoulder which prevents the pad from popping out when the punch is on its upstroke. The pad and the four die sections are now mounted in the die shoe opening, the pad in the down position. It is clamped securely so that it cannot move during the succeeding operation, which is setting up on the jig borer. Next we locate and drill for the extruding punches. By indicating the center of the two radii we have their exact location. Starting with a center drill each location is followed with a number of drills up to a few thousandths of specified dimensions.

The whole die is then disassembled. The pad is reamed for a slip fit over the

(Continued on Page 26)

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Designing Dies to Reduce Production Costs

(Continued from Page 24)

punches and the retainer plate for a press fit. The back of the retainer plate is counterbored to admit the shoulders of the punches. Of course a hole for the pilot also has been drilled during the jig borer set-up. The pad is now hardened and any distortion during this process will have to be corrected, either through grinding or lapping after hardening.

The gages and stripper fingers are machined, hardened, ground and mounted. After measuring the thickness of the bolster of the press the two pressure pins can be cut to the length required. The lower portion of the die can be considered complete.

The punch is now machined, set up in the jig borer, drilled and reamed for the extruding and pilot holes. The stripper clearance hole is milled in the punch holder. The punch, hardened and ground, is inserted in the die opening and spaced correctly by means of small pieces of the specified stock thickness all around its outside contour. The punch holder is then dropped over the leader pins and brought down on the punch. In this position the punch is clamped to the punch holder. After removing from the die this assembly can be drilled and reamed for screws and dowels. The pilot is inserted in its place and the punch permanently mounted in place. This should finish the assembly and the die, which will be of the utmost importance in developing the actual blank required, is ready for tryout.

The time estimate for this die is difficult because the die set is of special construction and cast to specifications. No time allowance for patterns, etc., will be made—only time consumed in actual construction of the die.

Estimate

MACHINING AND GRINDING

Column A—for time values see Table, Fig. 6

	Machining hr.	Grinding hr.
DIE 1—3″x4″x8″ (approx.)	1.2	1.4
DIE 2—3″x4″x8″ (approx.)	1.2	1.4
DIE 3—3″x4″x9″ (approx.)	1.3	1.5
DIE 4—3″x4″x9″ (approx.)	1.3	1.5
PAD—Tool steel casting 4½″ x12½″x⅛″	1.2	1.2
PUNCH	1.2	1.2
RETAINER PLATE—15″x 7½″x¾″	2.0	1.1
GAGES—7½″x3″x½″. Two required	1.4	1.6
STRIPPER FINGERS—4″x 3″x½″ CRS. Two required	1.2	1.4
STRIPPER FINGERS—(Supporting Blocks) 4″x3″ x1½″ CRS. Two required. .70 x .7 hrs. each. No grinding necessary	1.0	
TOTAL Column A	25.3 hrs.	

DRILLING ALL HOLES EXCEPT FOR PERFORATORS AND PILOTS

Column B—for time values see Table, Fig. 7 (Spring Hole Time Values, see Fig. 8)

DIES 1, 2, 3 and 4—3 screws, no dowels .4 each	1.6 hrs.
Gage mounting holes 1 and 2 .4 each	.8
PUNCH—4 screws, 2 dowels	.7
RETAINER PLATE—4 screws, 2 dowels; 2 clearance holes for air pins	.9
NOTE: No time allowed for holes of 4 die blocks since they are drilled together	
GAGES — Two required, 2 screws, 2 dowels each	1.0
STRIPPER FINGERS — same holes as gages	1.0
STRIPPER FINGER BLOCKS —same holes as gages	1.0
DIE SHOE—3 holes each die 1.2 4 screws, 2 dowels for retainer plate .9	2.1
PUNCH HOLDER—4 screws, 2 dowels for mounting punch	.7
TOTAL Column B	9.8 hrs.

LAYOUT AND INSPECTION

Column C—for contour time values see Tables, Figs. 9, 10, 11, 12

Layout

DIES 1, 2, 3 and 4 can be considered one piece as far as the layout is concerned and the die opening taken as a whole. Adding units as per

(Continued on Page 50)

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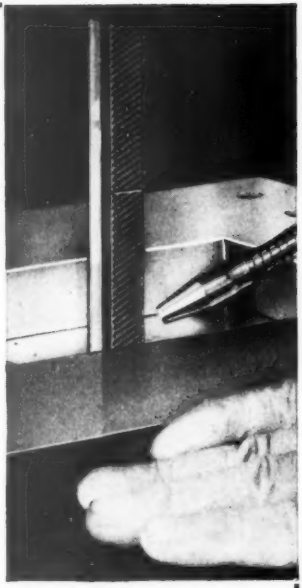

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An Alternate Design for a Stripper Type Mold

By Thomas J. Lester

The design discussed in this article is for the same part for which the ejector pin mold design discussed last month was designed. The part is an ink bottle cap, the design of which originally appeared in Chapter V of Thayer's "Plastics Mold Designing."

These designs have been prepared at the request of a number of our readers.

—The Editor.

THIS mold differs from the ejector type mold which was discussed and illustrated in Figs. 1, 2 and 3 (July issue, Page 21) in that when the mold opens the casting is stripped from cores and protruding mold members by a stripper plate, whereas the molded part in the ejector type mold is ejected or lifted off the same core members by means of pins. When a stripper plate is used, the surface of the casting is not marred since the stripper fits all around the casting at the parting line and there are no individual marks as made by ejector pins. The part to be molded is the same as detailed with the ejector mold.

Another variation is that this mold is designed to fit a different make of injection molding machine. The machine for which this stripper type mold was designed is equipped with two adjustable ejector rods (detail 1 of Fig. 4*) and no register provisions are made on the stripper mold half. In this case the complete mold is first clamped in place to the stationary mold mounting plate of the machine—clamping provision being the slot or groove (detail 8). The extended sprue bushing (detail 9) provides a register. The machine is then closed after alignment is made between machine ejector rods (detail 1) and clearance holes provided for them in the stripper base or core mounting plate. Next, the stripper mold half is clamped to the movable mounting plate of the machine—clamping provision in this case being the slot or groove (detail 4). The set-up is now complete except for the adjustment of the mold space between the platens of the machine.

*Page 30.

Construction Features

The injection or cover half of this mold consists of the following parts: cover binder, or cavity insert back-up plate, made of alloy steel (detail 19); cavity insert retainer plate, also made of alloy steel (detail 7); six cavity inserts, utilizing a suitable hobbing material (detail 16); sprue bushing with ball seat for abutment with the machine nozzle (detail 9); and guide pin bushings (detail 14).

The cavity insert back-up plate and the cavity insert retainer plate (details 19 and 7) are fastened together in the same manner as the corresponding plates on the ejector type mold.

The back-up plate (detail 19) is lathe machined and ground on the cavity insert side to insure parallelism. The cavity insert retainer plate is lathe machined also, and ground on both sides with holes bored for cavity inserts. The gating is machined in this plate because the shot will be removed with the stripper mold half and there will be no problem of the gates sticking with the stripper plate (detail 5). Fig. 6 (detail 21) shows part of a stripped shot or casting with the entire molded part flush with the surface of the stripper plate.

The stripper half of this mold consists of two alloy steel main plates and the following parts: stripper plate retainer bolts (detail 3); sprue sucker or stripper pin (detail 6); cavity cores (detail 13); stripper plate guide pin bushings (detail

(Continued on Page 30)

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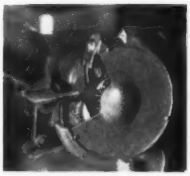

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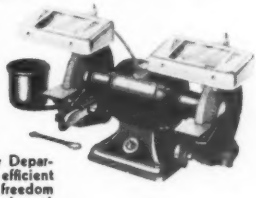

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3. Stripper plate retainer bolt
4. Slot or groove (stripper mold half)
5. Stripper plate
6. Stripper pin (sprue sucker)
7. Cavity insert retainer plate
8. Slot or groove
9. Sprue bushing (extended for register)
10. Core or base plate
11. Guide pin
12. Stripper plate guide pin bushings
13. Cavity core
14. Guide pin bushing
15. Water line
16. Cavity insert
17. Water line
18. Water line
19. Cavity insert back-up plate (cover binder)
20. Mold cavity
21. Molded part or casting

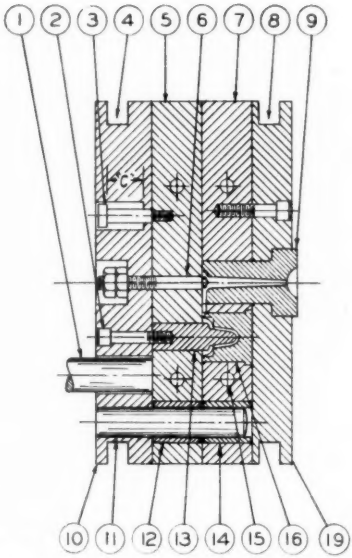
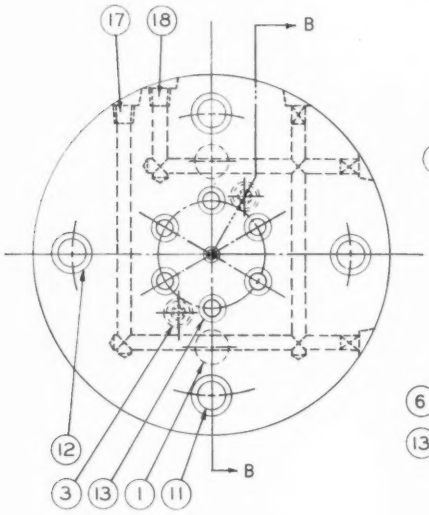
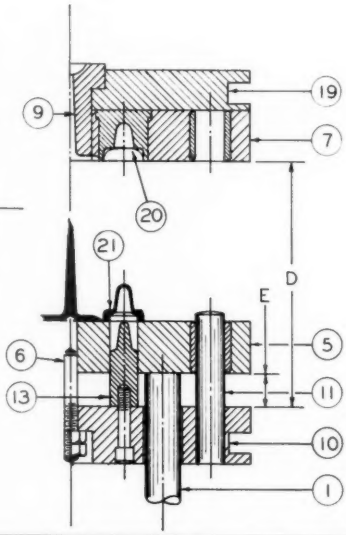


Fig. 4, right—sectional elevation.

Fig. 5, below, left—view facing injection half.

Fig. 6, below, right — view shows basic stripper plate design.





12); and guide pins (detail 11).

The two main plates are the core or base plate and the stripper plate. The core plate is lathe machined and ground on the core fastening side. The stripper plate is also lathe machined, but ground on both sides.

(Continued on Page 45)

General Preference Orders on Cutting Tools

THE Director of Priorities issued a General Preference Order No. E-2, effective July 17 (in effect to November 30, 1941), regulating the use and distribution of cutting tools. Considered necessary because of the increasing shortage of cutting tools, the order is addressed to both manufacturers and distributors.

Two pertinent points of direct interest to the small tool manufacturers and the users of small tools are quoted: "After July 17, 1941, no orders for Cutting Tools, as defined herein, shall be accepted, nor shall deliveries of such Cutting Tools be made by a Manufacturer or Distributor, unless such orders or deliveries bear a preference rating of A-10 or higher.

". . . Work on orders or contracts which are in actual production on July 17th, 1941, may be continued in accordance with existing production schedules for a period not in excess of six weeks."

A supplementary order issued on July 25 adds cemented carbide tools to the definition of cutting tools, forbids acceptance of an order or making of a delivery of cutting tools when such an order bears a preference rating of A-10 or higher, except upon specific direction of the Director of Priorities. The original order permitted delivery of non-defense orders if Defense orders on hand had been completed. The supplementary order also clarifies the special provisions which relate to manufacturing processes carried on for the six weeks' period from July 17.

On August 1, the Director of Priorities issued Preference Rating Order No. P-18 granting limited blanket preference rating to approximately 100 cutting tool manufacturers. This order affects material going into cutting tools. The manufacturers granted the use of the order may apply a rating of A-1-a to deliveries from their suppliers for the production of specified defense products defined in the order as: "Drills of all types and sizes; reamers; countersinks; counterbores; milling cutters of all sizes and types; hobs of all sizes and types; taps;

(Continued on Next Page)

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Send the coupon, or write Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Boston, Buffalo, Philadelphia, Jersey City.

Ryerson stocks include:

Structurals
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Stainless
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Nuts, Bolts
Rivets, etc.

Position .....
Name .....
Company .....
Street .....
City ..... State .....

Tear out, Mail Today!

General Preference Orders on Cutting Tools

(Continued from Page 31)

high speed chasers for self-opening die heads; high speed chasers for collapsing taps; machine broaches; and cemented carbide cutting tools of all types."

Materials to which the preference rating may be applied are: High speed steel; carbon tool steel and alloy steel bars; sheets; rods; shapes; forgings and castings; cutting tools, including cemented carbides; abrasives; measuring instruments and gages; maintenance and shop supplies (restricted to items necessary for proper operation and maintenance of manufacturing equipment and facilities).

The blanket preference rating is P-18 and is similar in form to other limited blanket preference orders issued to certain classes of Defense manufacturers.

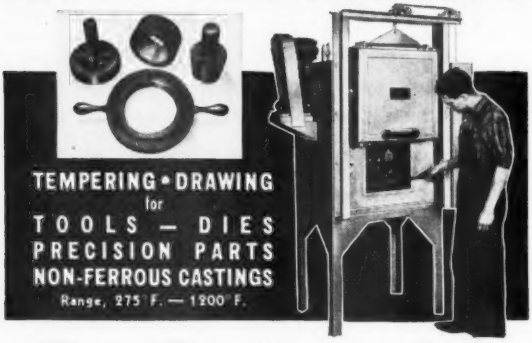
Training Within Industry Bulletin

TRAINING Within Industry Branch, Labor Division, OPM, has just issued Bulletin No. 1-A, "Organization and Personnel." This branch, established to help Defense contractors and sub-contractors solve their supervisory and trained manpower problems, maintains 22 district offices throughout the United States. Bulletin No. 1-A lists the complete personnel of the headquarters, including the Headquarters Advisory Committee, composed of six representatives of Management and six representatives of Labor, and Headquarters Technical Consultants and the complete field organization.

Each District Representative has four advisors, two representing Management and two representing Labor. The names of these men are listed. In addition, each district has a number of Consultants who render personal service to individual manufacturers. Such Consultants, being members of the industrial community they serve, bring extensive experience in the fields of management, production and personnel.

A copy of Bulletin No. 1-A "Organization and Personnel" will be sent to Defense contractors and sub-contractors on request. Address Training Within Industry Branch, Labor Div., Office of Production Management, Social Security Bldg., Washington, D. C.

More Production



TEMPERING • DRAWING
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TOOLS — DIES
PRECISION PARTS
NON-FERROUS CASTINGS
Range, 275° F. — 1200° F.

For Defense!
***NEW* TOOL ROOM FURNACE**

This furnace is responsible for increasing production in countless defense plants. Its convenience, its accuracy and general usefulness will improve your precision heat treating. Available in 12 standard sizes.

Prompt Deliveries Maintained!

WRITE TODAY FOR BULLETIN No. 83-0 for complete details and prices on gas or electrically heated furnaces.

DESPATCH
OVEN COMPANY · Minneapolis, Minnesota

Die Supply Announces Complete Line of Die Springs

J. R. FITZSIMONS, president of Die Supply Co., Cleveland, O., announces that with recent shipments received his company now stocks three complete lines of die springs. Said to be the most comprehensive stock of die springs in the United States, the three lines cover a wide range of sizes for every possible tool room, die shop and stamping plant use.

The three lines are Medium Pressure —50% Deflection, Medium-Heavy Pressure—37% Deflection and High Pressure —30% Deflection. The medium and high pressure spring lines are made of electric furnace chrome vanadium steel, which has proven so successful under the severest operating conditions. The medium-heavy pressure die spring line stock is that of a leading manufacturer.

Some of the medium pressure and high pressure springs were manufactured to special order in order to complete the range of sizes. Square and music wire die springs are also carried in stock. The Die Supply Company also maintains a warehouse stock and assembly plant for Producto Die Sets and such well known items as the Cerromatrix line, Hardsteel Drills and Dayton Rogers Tryout Fluid.

A new 8-page circular giving complete Weight and Deflection Charts of the three lines of Die Springs and brief data on other die supplies will be sent on request. Address Die Supply Co., 1390 E. 30th St., Cleveland, O.

Allegheny Ludlum Building New Defense Plant

A VITAL new unit in the Nation's expanding facilities for production of alloy steels for Defense purposes will be the Allegheny Ludlum Steel Corporation's new Brigham Road "Defense Plant" at Dunkirk, N. Y. When completed, the plant will produce alloy steel bars hot rolled, cold drawn and centerless ground, and rods, which will be used for armament and other Defense production.

Because of a recent increase in the planned capacity and a revision in types of equipment, the plant will cost approximately $4,000,000 instead of the $2,500,000 originally estimated last spring.

MAKE SKILLED HANDS MORE SKILLFUL

In toolrooms and die departments the country over, Starrett Tools are helping to speed production by guarding vital precision measuring operations. With dependable Starrett Tools on the job, even the closest tolerances leave plenty of room for speed and confidence. Write for Catalog No. 26 "DM".

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Precision Tools . . . Dial Indicators . . . Ground Flat Stock
Hacksaws . . . Metal Cutting Bandsaws . . . Steel Tapes
ATHOL, MASSACHUSETTS, U. S. A.

Standardize on STARRETT TOOLS
BUY THROUGH YOUR DISTRIBUTOR

Jessop Erecting Plate Mill

AS a part of a large plant expansion and modernization program being undertaken by Jessop Steel Company in the interests of National Defense, construction of a new 84-inch two-stand plate mill has begun. The new plate mill will be housed in an extension of the company's sheet mill building. The mill is electrically driven and will be supplemented by the installation of six modern heat treating furnaces capable of increasing plate production 50%.

Already completed is the installation of two modern gas-fired annealing furnaces in the bar mill and a new ingot heating furnace in the cogging mill. All three furnaces are pyrometrically controlled. The bar mill furnaces have increased production capacity about 15% and the cogging mill furnace about 10%.

New Escolite T-Square

THE new Escolite T-Square with a full transparent blade edge of Escolite and head of black laminated Bakelite is the latest product of the Engineering Sales Company of Sheboygan, Wis. Both

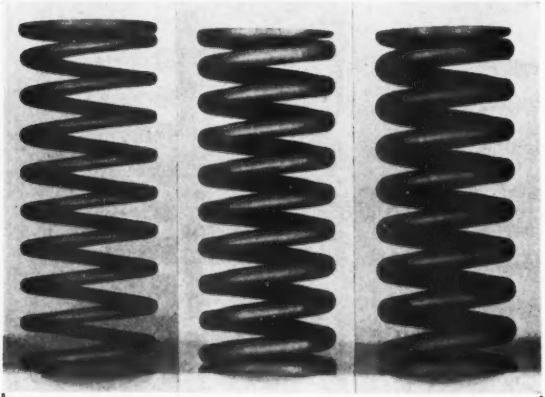
plastics materials have been specially selected and will not warp, bow, chip, crack or split. The Escolite is a crystal-clear plastics material that will not discolor or turn brittle.

A patented removable head construction is a feature. Eight cone-shaped pins are accurately and securely set into the head and engage corresponding holes in the blade, eliminating wobble and automatically taking up play. A special die casting and single screw holds the entire assembly together. The blade is instantly removable for use as a straight edge. Escolite T-Squares are made in seven popular sizes.

A new catalog, giving complete information on Escolite T-Squares and full line of fine drawing equipment made by this company, will be sent on request. Write Engineering Sales Co., Sheboygan, Wis., and ask for Catalog ST-9.

The new and enlarged Second Edition of "Die Designing and Estimating" will be ready about Sept. 1.

Three Lines of Die Springs



We now stock three complete lines of Die Springs: Medium Pressure—50% Deflection; Medium—Heavy Pressure—37% Deflection; and High Pressure—30% Deflection.

Heat Treated Alloy and Common Screws—Cerromatrix—Hardsteel Drills—Dayton Rogers Layout Fluid.

Ask for new Die Spring Bulletin

DIE SUPPLY COMPANY

J. R. Fitzsimmons W. H. Fitzsimmons Jos. T. Fitzsimmons

Telephone CHerry 6818

1390 East 30th St. Cleveland, O.

Continental Announces Opening of Trade School

THE DoAll Trade School officially opened classes July 28th according to an announcement by R. J. Wilkie, vice president of Continental Machines, Inc., of Minneapolis, Minnesota. The School, developed and operated as a "free" school, will give the trainees selected one, two and three month courses in machine tool operation. The curriculum is planned to aid in filling the pressing need for machine tool operators by training both beginners and experienced men in the most modern methods of contour machining and surface grinding.

Working conditions will parallel as nearly as possible those of modern industrial plants. Classes will be open eight hours daily for five days each week in the training shop with training on twelve new DoAll Contour Machines, two new DoAll Surface Grinders, as well as lathes, shapers and milling machines found in the modern production plants. During the daily lecture hour instruction will be given on blue print reading, layout methods and metallography.

This plan will give each trainee 200 to 500 hours of actual shop experience along with the lecture courses supervised by Lloyd Erickson, formerly one of the supervisors of Continental Machines Production Department. J. T. Thompson, formerly of Oliver Equipment Company, will be the General Director of the School, handling applications and placement of graduates.

DOUGLAS

UNIVERSAL SLOTTERS

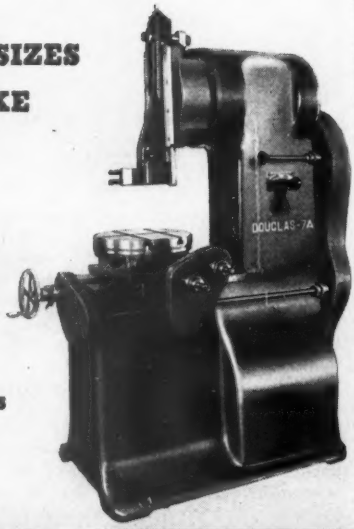
BUILT IN 3 SIZES

7" STROKE

8½" "

10" "

Large scale production ensures quick deliveries

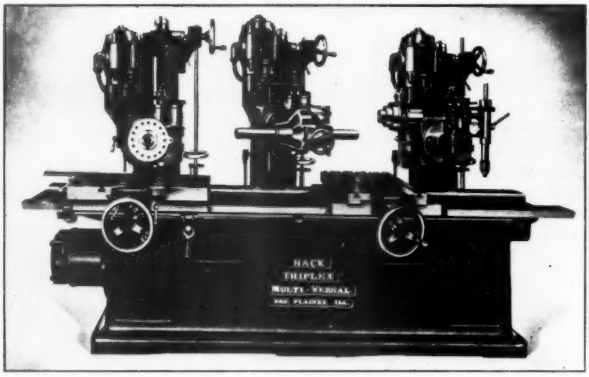


DOUGLAS MACHINERY CO., INC.

150 Broadway, New York, N. Y.

Hack Adds Duplex and Triplex Multi-Versal Tool Room Machines to Line

THE Hack Machine Company, manufacturers of the Hack Multi-Versal tool room machine, have recently added two new machines, the Hack Duplex Multi-Versal and the Triplex Multi-Versal, to its line. The latter is shown in the illustration. These two new machines, which carry still further the principle of "all purpose utility" which has characterized the standard Simplex Machine, have been built and designed especially for heavy production tool room and machine shop work and are particularly well adapted for the machining of all complicated piece parts for Defense needs.



The Duplex machine is a two column machine embracing the standard Multi-Versal at the left and a 2½" horizontal boring bar in the center of the column as illustrated. This bar has a travel of 18" and can be rotated 360 degrees to bore holes at various angles. The bar is fitted with a taper at both ends and will machine work on either the left hand or right hand tables.

The Triplex machine has a third column at the right which is normally fitted with a radial drill head but this column is so constructed as to permit the use of any of the regular Multi-Versal attachments.

The column at the left has the constant reciprocating motion typical of the Simplex Multi-Versal but the middle and right hand columns are stationary. These last two columns may be interchanged to meet requirements and additional columns may be added to complete a sequence of operations with one pass of the table.

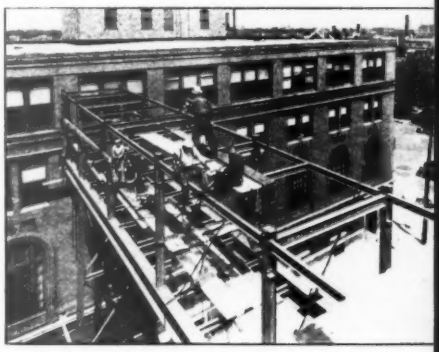
Two men can operate this machine, if necessary each performing a completely different operation. Extremely long work can be machined by straddling both tables.

The underlying principle as in the case of the Simplex Multi-Versal is that in many cases jigs and tools can be completely machined on this equipment without removing the work and a sequence of operations such as vertical milling, angular milling, horizontal milling, horizontal boring, radial drilling, vertical, horizontal and angular jig boring, slotting and many other operations, including all of those previously done on the Simplex Multi-Versal, can be accomplished at a considerable saving of set-up time.

Both new Multi-Versal machines are equipped with vernier scales in either direction and have speeds that make them adaptable to the machining of aluminum alloys as well as cast iron, mild steel and tool steel.

For a copy of new catalog "Hack Duplex Multi-Versal and Triplex Multi-Versal" containing complete details, address Hack Machine Company, 1230 Harding, Des Plaines, Ill.

Bridge and Loading Facilities Speed Ryerson Service



THE new connecting bridge between two main office buildings at the Joseph T. Ryerson & Son, Inc. 21-acre steel-service plant in Chicago and rebuilt and enlarged loading doors are among the latest additions made necessary by extraordinarily heavy customer requirements at that plant.

When completed, the 66-foot glassed-in span (see illustration) will hasten the flow of work between departments and considerably speed customer service. Ordinarily, expanding office operations are cared for by large reserve space provided for such contingencies, but rapidly spiraling office activities forced several departments to occupy larger quarters. Quicker, more efficient service is expected to follow this move.

Rebuilt and enlarged loading doors have been newly added—aiding faster loading and dispatching, and assuring prompt pickup for will-call customers. A total of 35 trucks can now be loaded at the Chicago plant at one time. This is believed to be the largest capacity of any steel-service plant in the world.

Ryerson's network of 10 steel-service plants, strategically located in important industrial areas, provides prompt nation-wide service to all steel users.

"Plastics Mold Designing"

"Plastics Mold Designing" by Gordon B. Thayer, is the first book on its subject written by a practical shop man who also has had teaching experience. Clarity, conciseness and logical sequence of all material is the result. *See page 45.*

Chip BREAKER!
By HAMMOND
Rough and Ready Chip Breaker Grinding is costly to high-speed production. Get a Hammond "4" Chip Breaker Grinder to be sure carbide tools are being ground speedily and with maximum accuracy. Big feature . . . the sensational ANY ANGLE VISE . . . adjustable on 3 separate planes.
Hammond of Kalamazoo
HAMMOND MACHINERY BUILDERS, INC.
KALAMAZOO, MICHIGAN
Tear out
And mail this coupon today for complete details on carbide tool maintenance

Dayton Rogers Adds Heavy Duty Multiple Pneumatic Die Cushions

A NEW Heavy Duty, Multiple Mounting Pneumatic Die Cushion particularly suitable for large, straight side presses, for the drawing and forming of such parts as table tops, stove tops, refrigerator sections and automobile body doors, etc., has just been added to the line of the Dayton Rogers Mfg. Co., Minneapolis, Minn.

These new heavy duty die cushions designated as Model 2C, are self-contained, carry their own surge tanks, and are being made in sizes up to and including 24". They can be furnished in multiples of two, four or six, having maximum ring holding pressure up to and including 90 tons, with drawing capacity for deep drawing shells up to and including 10".

These cushions can be used for controlling the pressure pads; also, on all forming operations. Each cushion installation is supplied with a combination regulating reducing valve and pressure gage to retain the correct draw ring holding pressure and pressure pad control throughout the work cycle. The working pressure is recorded at all times, psi, on the pressure gage furnished with each installation.

Specification Sheets and installation data on the model 2C Heavy Duty, Multiple Mounting Pneumatic Die Cushion will be sent on request. Address Dayton Rogers Mfg. Co., 2830 13th Ave. S., Minneapolis, Minn.

Only standard tool room equipment — plus a brazing furnace or oxy-acetylene torch — are needed to make your own **KENNAMETAL** steel-cutting carbide tools. A recess is milled in the steel shank with an end mill; flux and brazing material are melted in the recess; a **KENNAMETAL** tip is fitted in place and flux and brazing material again melted; and after the tip has "set", clearance angles are ground on the assembled tool.

Standard **KENNAMETAL** tips are shipped within 4 days of receipt of order. Factory made **KENNAMETAL** tools are shipped within ten days, or immediately if in stock. Send for Catalog 41 containing sizes and prices of standard styles and detailed instructions for brazing **KENNAMETAL** tools.

McKENNA METALS Co.
500 LLOYD AVE., LATROBE, PA.
FOREIGN REPRESENTATIVES U S STEEL EXPORT CO
Exclusive of Canada Great Britain and Possessions

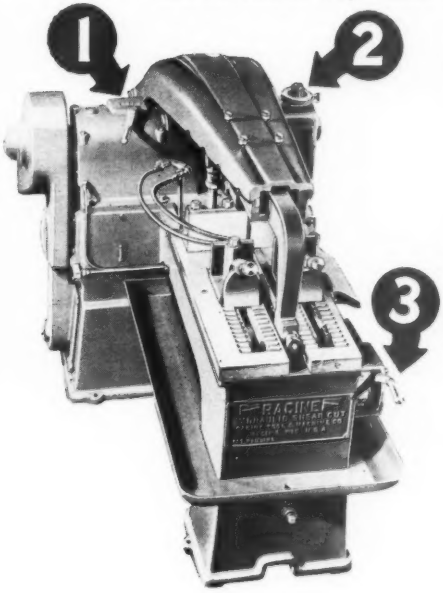
Finger-Tip CONTROL

Speeds Production WITH

RACINE

HEAVY DUTY HYDRAULIC METAL CUTTING MACHINES

Ease of handling saves real time in Tool & Die Cutting and RACINE Hydraulic saws do just that!



1. Speed Change Control . . . Single lever controls three speed transmission for cutting all types of steel.

2. Single Dial Controls pressure and feed. Sensitive, accurate control of cutting from thinnest walled tubing to toughest tool steel and die blocks.

3. Single Lever All Front Control governs rapid traverse up and down, clutch engagement and rest positions, all operating phases of the machine.

RACINE modern hydraulic saws, 6 x 6, 10 x 10, up to 14 x 20, are unequalled in the fast, accurate cutting of die blocks—bar stock—structurals—in steel mills—shipyard and production plants—wherever metal cutting jobs are tough. Send for information today.

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1768 STATE ST., RACINE, WISCONSIN

MACHINE TOOL BUILDERS AND MANUF

DRIVE-ALL

Send for descriptive folder and specifications.

Prompt Deliveries!

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ANUFACTURERS OF POWER EQUIPMENT

COMPLETE UNIT TRANSMISSIONS,

DRIVE-ALL

MANUFACTURING COMPANY

3400 Conner Ave., Detroit. Mich

Taylor Mfg. Co. in New Plant

The Taylor Manufacturing Company, builders of "HI-EFF" Drilling Machines, Drill Presses, hydraulic dynamometers and static balancing machines has occupied its new plant at 3056 West Meinecke Ave., Milwaukee, Wis., as of July 1.

The new building was especially built for the company. Production facilities, severely overtaxed by both Defense and other work, will be considerably stepped up, according to Charles V. Kray, sales manager.

New Aro Pneumatic Tool Catalog Issued

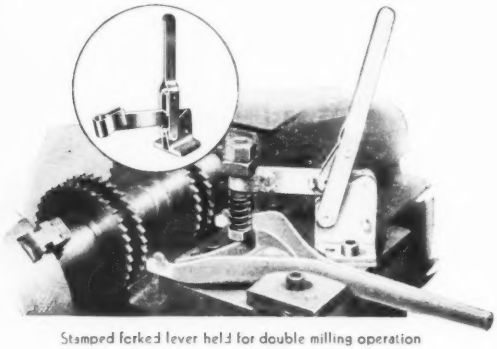
A NEW catalog (No. 41), illustrating and describing an extensive line of pneumatic tools for tool and die shops and industrial use, has just been issued by The Aro Equipment Corp., Bryan, Ohio.

Pneumatic screw drivers, nut setters, drills, right angle drills, grinders, rotary files, sanders, polishers, etc., are illustrated and described with detailed specifications.

Among the new items recently added to the Aro line is a high speed turbine type grinder (illustrated) which attains a speed of 80,000 rpm with wheels up to 3/8". Light and small, it may be held in the hand like a pencil, or mounted for tool post grinding. This unit is of special value in touch-up work on dies, molds, hardened bushings, relief grinding, tool salvage, sharpening and marking hardened as well as soft dies, fixtures or parts.

High speed aircraft drills, clutches, adaptors and other accessories and parts are also listed and shown.

For a copy of Catalog No. 41, "Pneumatic Tools for Industry," address The Aro Equipment Corp., 114 Madison St., Bryan, O.



Stamped forked lever held for double milling operation

for Low Cost Production
Use **DE-STA-CO Toggle Clamps**

In every operation where parts must be held in fixtures for drilling, milling, welding, assembly and the like, the production *rate* depends upon positive clamping—and instant release . . . And production *costs* likewise.

De-Sta-Co quick-acting Toggle Clamps are nationally recognized as the efficient, low-cost method of designing and carrying out production . . . Write now for Bulletin No. 41, showing types and sizes best fitted to your requirements.

DETROIT STAMPING CO.
Established Over 25 Years
344 Midland Ave • Detroit, Mich.

Honing: Stock Removal for Surface Finish

(Continued from Page 19)

straightness are generated successfully.

Honing machines may be either the horizontal or vertical type. The kind of work, of course, has something to do with the choice of the machines. Regardless of its type it must be of rugged construction, but with sensitive, yet accurate and simply controlled functions. The horizontal type permits of easier and more simple set-up. It functions perfectly on strokes of a few inches and when a bore reaches three feet and over, it has very definite features to recommend it, not the least of which is the added centrifugal action of the coolant derived from the honing tool, permitting the washing away of "wild" abrasive and providing greater cooling value. A horizontal set-up permits easy accessibility for inspection of the bore in the hone and intensifies control of the process.

The United States Navy uses a horizontal type honing machine for finishing gun barrels which are as much as 5 feet in length and 16 inches in diameter. The grinder itself is 30 inches long and with the stroke of the machine 60 inches, the bore is trimmed progressively in sections.

Theoretically, there is no limit within practical cylindrical working bores for honing tools and machines. Some machines could hone 50 to 100 feet if necessary, depending, of course, upon their design and probably some special adaptations. A machine designed and built for maximum sizes of bores can naturally be used for minimum sizes, although at a reduction in efficiency.

Part 2 of this important article will discuss co-directional honing, honing sticks, methods for generating accuracy for roundness, diametrical and axial straightness. It will appear in the September issue.

McKenna Appoints Morris

Archie A. Morris has recently been appointed Southern California representative for McKenna Metals Co., Latrobe, Pa., manufacturers of Kennametal steel-cutting tools and blanks. Mr. Morris has had wide experience in carbide tool designing and application. Offices remain at 4905 Santa Fe Ave., Los Angeles, where a stock is maintained.

What Johansson Gage Blocks mean to Defense Production

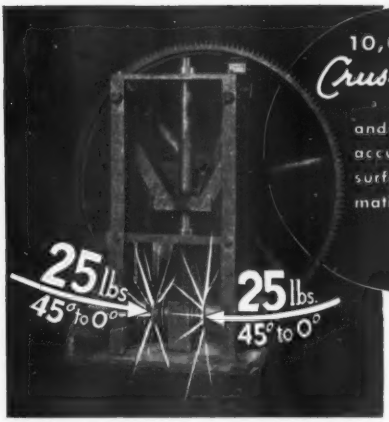
FACTORIES and shops engaged in production of precision and interchangeable parts have an accurate, economical and practical gaging system in Johansson Gages and Accessories.

Virtually every measurement of length that is made with commercial measuring tools can be made *more quickly* and *more surely* with this equipment.

Unsurpassed accuracy has established Johansson Gage Blocks as the world's standard of precision measurement.

FORD MOTOR COMPANY
Johansson Division (Dept. H)
Dearborn, Mich.

JOHANSSON GAGE BLOCKS



These economical long wearing tools are made in sizes and weights to meet every need. Insist on genuine Chicago Rawhide Hammers.

- We built a machine to simultaneously punish, batter and pound both faces of a Chicago Rawhide Hammer with crushing continuous blows.
- 10,000 times, two giant 25 lb solid steel knurled-faced hammers dropping 19" at 45°, struck both faces simultaneously.
- The genuine Java Water Buffalo hide faces had *worn off* 1/8" (less than one-quarter of the useable insert) but still had a smooth, accurate striking surface.

- *Chicago Rawhide Hammers and Mallets which strike hard blows softly, without damage can take hard blows indefinitely without damage.*

Q. E. D.

CHICAGO Rawhide MFG. CO.
1280 ELSTON AVE. ★ CHICAGO, ILLINOIS.

MAC-ITS Save on Production, Maintenance and Design!
Stronger, more accurate screws can end many tie-ups, cut costs all along the line. When you design to take advantage of them, Mac-its give you all these savings in 16 standard items. For complete details on the only complete line of heat-treated alloy steel screws, call your Mac-it distributor or write for Catalog 40.
1
THE STRONG, CARLISLE & HAMMOND CO.
1392 West Third St., Cleveland, Ohio

Stripper Type Mold Design

(Continued from Page 30)

The cavity insert retainer, stripper and core plates are now clamped together. Guide pin bushing and guide pin holes are bored first, cavity inserts and core holes next. The guide pins, which are in the stripper half of this mold, are to be press-fitted in the core plate (detail 10). Guide pin bushing (details 12 and 14) are press-fitted with stripper and cavity insert retainer plates (details 5 and 7) respectively. The cores are lathe machined, polished on plastics contacting surfaces, and ground to insure close tolerance with the bored holes in the stripper plate. A tapped hole provides the fastening between the base plate and cores by socket head screws (detail 2).

Design Features

Stripper plate retainer bolts (detail 3) are incorporated because the stripper plate is not fastened to the core plate. It is evident that without these pins there would be a possibility of the plate coming off the guide pins and falling from the machine. The stripper plate is permitted to travel the distance space C in Fig. 4. This distance should be slightly more than space E in Fig. 6 because if distance E were greater than distance C the machine ejector rods would either strip the threads or break the stripper bolts. Space D, Fig. 6, is the amount of distance the machine opens. Space D minus space E is the amount the machine opens before the ejector rods stop the stripper plate.

The sprue sucker or stripper pin (detail 6) is fastened to the stripper core plate as shown and is made in such a way that when the plastics material is injected into the mold it flows around the diamond shape designed to provide an undercut which will withdraw the plastics sprue from the sprue bushing as the mold opens. When the stripper plate is stopped by the machine ejector rods the sprue stripper pin will strip from the plastics material (detail 21) leaving it free to fall or be removed from the mold. Similar pins may be used to remove gating on molds where long or heavy gates are used.

It is evident that no ejector pin marks will appear on the parting line surface of the molded casting if it is molded in a stripper type mold. In many cases this

(Continued on Page 47)

"INVALUABLE

to anyone in the Plastics Field"

—says Modern Plastics

PLASTICS MOLD DESIGNING

By

Gordon B. Thayer

A book on Plastics Mold Designing written by a man who knows his subject by virtue of both engineering training and practical experience in the Industry.

ACCEPTED and COMMENDED

by important men in the Plastics Industry

"It is one of the most difficult of tasks to describe minutely a complicated mechanical procedure and keep it both understandable and easy to read. Mr. Thayer has done both in his description of the detailed processes of mold design and construction. . . . As a basic presentation it fills an important void in the Industry."

George K. Scribner, President Boonton Molding Company, Secretary Molders Section, The Society of the Plastics Industry

"If you're designing for plastics, building molds or molding, we believe you'll get your money's worth easily."

The "Durez Plastics News" of Durez Plastics & Chemicals, Inc.

"Leading features of the book are the strictly modern Mold designs and the extensive nomenclature section."

The "Bakelite Review" of Bakelite Corp.

Price $2.00 Paper cover

$2.50 Cloth board binding

Send orders to

AMERICAN INDUSTRIAL PUBLISHERS

329 Fairmount-Cedar Bldg. Cleveland, O.

Recent Industry Publications

GRINDING CARBIDE TIPPED TOOLS—this newest 64-page Norton Handbook, uniform with other Norton tool room treatises, is devoted to reconditioning and sharpening single point cemented carbide tools. Four sections are given to Metal Bonded Diamond Wheels, Resinoid Bonded Diamond Wheels, Green Crystolon (silicon carbide) Wheels and General Information. The handbook is well illustrated, the subject matter practical for the shop man, and the technical data, including New Type Designations and Marking System for Norton Diamond Wheels, is indexed for efficient reference. For a copy of "Grinding Carbide Tipped Tools" write Norton Co., Worcester, Mass. Ask for Form 167-T.

SAVINGS IN TIME AND MONEY—Bulletin F-955, issued by the Chicago Wheel & Mfg. Co., Dept. TD, 1101 W. Monroe St., Chicago, Ill., tells how such savings may be accomplished with the "Chicago" Soft Rubber Polishing Wheels. These wheels are the solution for the tough polishing problems—they save hours of hand drudgery in finishing tools, dies, jigs and fixtures. Five different types of polishing compound are impregnated in each wheel, with sufficient cutting grit to make finishing and polishing become one and the same operation. Write for your copy of Bulletin F-955 today.

GRAPHITIC TOOL STEELS—Standard Classification of Extras—lists the base prices of high speed and tool steel and details extras for size, annealing, cutting and quantity. Also included are extras for forged discs, annealed forged rings, tool holder bits, bevelling, shearing, etc. For your copy address The Timken Roller Bearing Co., Steel & Tube Div. T, Canton, O.

SELFLUBE POROUS BEARINGS—A revised catalog describes the properties and uses of these self-lubricating bearings and furnishes complete details on the correct method of installation. Many different shapes of Selflube porous bearings are illustrated. The last two pages contain graphs showing the allowance on these bearings for press fit into housing and the allowance for running fit after installation. Write for your copy of the revised catalog. Address Keystone Carbon Co., 1930 State St., St. Marys, Pa.

PROSSER CEMENTED CARBIDE TOOL GRINDER—A new bulletin gives complete specifications and Price List on the Model AA Carbide Tool Grinder. A number of applications are illustrated. The Price List incorporates information as to type, size and price of grinding wheels for use with the machine and prices of other accessories. Address Thomas Prosser & Son, 122 Wall St., New York, N. Y., for your copy of Bulletin and Price List.

KNU-VISE CATALOG—A 24-page Catalog just issued by Knu-Vise, Inc., Highland Park, Mich., covers this well-known line of Toggle Action Clamping Fixtures. It features 22 different models of clamps, pliers, plier-parallels, "C" clamps, riveters and drill fixtures. Fully detailed drawings of classes of clamps and instructions for installation are included. The latest price list will also be sent at your request. Write Knu-Vise, Inc., 16841 Hamilton Ave., Highland Park, Mich.

WILLARD SPRING TOOL HOLDERS—for forming, threading and cutting-off applications—are illustrated in Bulletin AO issued by the Auto Ordnance Corp., 1435 Railroad Ave., Bridgeport, Conn. The number, size of holder, size and price of each cutter and price for the complete unit are given for easy ordering. These tool holders, according to the manufacturer, eliminate chatter, reduce cutter breakage and assure accurate work. Send for your copy of Bulletin AO today.

ALLIGATOR BRAND FILES—Catalog No. 6 issued by Carson-Newton Co., Belleville, N. J., lists the complete line of Alligator Swiss Pattern Files and the Du-More Grade A and Kleen-Kut Grade B American Pattern Files. This company has made Swiss pattern files for more than 30 years and numbers leading users among its customers. Price lists will be included at your request.

JESSOP HIGH CARBON-HIGH CHROME DIE STEEL—Bulletin 441 gives methods and specifications for annealing, hardening and tempering of C.N.S. Die Steel. Charts showing tempering range, coefficient of expansion and Izod impact value make this 6-page bulletin of particular interest and value for operating executives who are looking for a steel suited for general purpose work where high wear resistance combined with shock resistance is needed. For your copy of Bulletin 441 write Jessop Steel Co., 610 Green St., Washington, Pa.

HEAT TREATING BY ELECTROTHERMIC-PERMEATION—A complete description of Electrothermic-Permeation, the new principle employed by Upton Electric Salt Bath Furnaces, is described in a new 8-page folder. The method of operation, which is especially suitable for the hardening of the various "Moly" high speed steels now being substituted for 18-4-1 types due to the shortage of tungsten, is available in any of the complete line of furnaces. Ask for a copy of Bulletin No. 129-4 when you write Upton Electric Salt Bath Furnace Div., Upton Electric Furnace Co., Melville Ave. and Green St., Detroit, Mich.

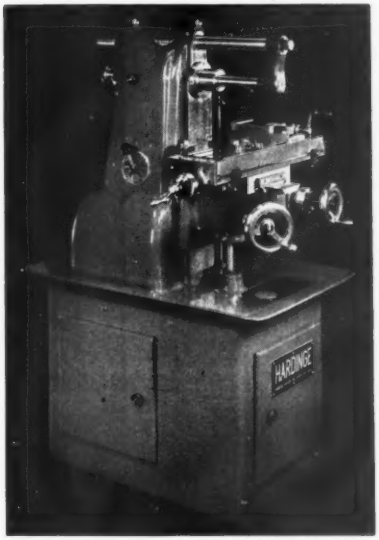
SCHULTES MOTOR DRIVE UNIT—is fully described and illustrated in Bulletin TD. Cross sectional views of the unit, with typical installations, are shown. Gear ratios, capacity of the unit and adaptability features are given. Send for your copy of this Bulletin. Address Westlof Tool & Die Co., 4190 Bellevue Ave., Detroit, Mich.

GEM MACHINE VISES—Drill press vises, milling machine vises, combination vises and the large all-steel vise, comprising the entire line made by the J. E. Martin Tool and Die Works, Springfield, O., are all described and illustrated in Bulletin M. Width, depth and span of jaw and overall length, width and height and weight are given for each vise. Construction features and applications are included. Send for your copy of Bulletin M today.

(Please turn to Page 48)

New Hardinge Tool Room Milling Machine Announced

THIS High Speed Precision Milling Machine was designed to meet a definite need in the modern tool room and die shop. Accurate, rugged and easy to operate, the Hardinge Tool Room Milling Machine was developed to meet the demand for a proper size machine to do exact milling operations on smaller parts.



Actual experience by many tool rooms as well as production manufacturers has verified the logic of using the proper size machine for the work being done.

(Continued on Page 49)

Stripper Type Mold Design

(Continued from Page 45)

is a definite requirement and in such cases the type of mold illustrated in Figs. 4, 5, and 6 should be used.

Another advantageous feature apparent in this type of mold is that no open space is required behind the cores for an ejector mechanism. This means the cores and retaining plates are backed up solidly by the movable press platen. With no ejector box opening, bending of the mold faces at the parting line is eliminated. In this way flashing due to mold construction will be held to a minimum.

HI-POWER GRINDER SPEEDS AMERICA'S PRODUCTION

For hundreds of difficult grinding jobs, nothing compares with the HI-POWER—a constant service tool that gives smooth, precision performance. Has ample power to drive a 2½" diameter wheel. 17,000 r.p.m. Wt. 3 lbs. In wood case, with accessories, $35.00.

CHICAGO MOUNTED WHEELS — FIRST AND FINEST

Actually cut grinding costs ⅓ to ½. Made of V/T Super Bond, the toughest bond made—will stand up under the most exacting conditions. Hold their shape and grind more pieces per wheel faster and without sacrifice to cutting action.

TEST WHEEL—Try one free. Tell us kind of job, grinder you use and size wheel preferred.

HANDEE TOOL OF 1001 USES

The little Caesar of grinders. Also drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, etc. De Luxe model 12 oz. 25,000 r.p.m. With 7 accessories, $18.50.

IMMEDIATE SHIPMENT — Send for the HI-POWER or the HANDEE on 10 Days' Trial.

Catalog of Complete Line on Request.

Chicago Wheel and Mfg. Co.

Makers of Quality Products for 40 Years

1101 W. Monroe St., Dept. TD, Chicago, Ill.

Canadian Office - 1332 William St., Montreal

Recent Industry Publications

(Continued from Page 46)

GENERAL CATALOG OF SPECIFICATIONS AND STOCK—The new 110-page Catalog of The Bissett Steel Company lists the Tool and Die, Alloy, Stainless, Aircraft and other steels warehoused by this company. Tool Steel Tubing, a specialty with this company, is also listed. Particular attention is given to technical data and numerous charts showing the physical and chemical properties of alloy steel. Recommended applications and heat treatment for each type of steel are given. A number of useful tables and a detailed index add to the value of the Catalog as a reference book for the selection of steels. A copy of Bissett General Catalog will be sent promptly on request. Address the Bissett Steel Company 947 E. 67th St., Cleveland, O.

DE-STA-CO TOGGLE CLAMPS—New Bulletin No. 41 illustrates and gives detailed scale working drawings of every size and type of toggle clamp in the De-Sta-Co line. The "C" Clamp with Quick Acting Toggle Movement and toggle pliers are also shown. A number of photographs show a wide range of applications of the De-Sta-Co Toggle Clamps. For your copy of De-Sta-Co Bulletin No. 41, write Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.

STRAND FLEXIBLE SHAFTS AND MACHINES—Catalog No. 28 brings to the attention of manufacturers of tool room and die shop equipment the advantages in the use of Strand Flexible Shaft Machines by picturing and describing in detail their complete line. Complete specifications of each machine are given. Price, size and type of accessory are also listed. Strand manufactures flexible shaft equipment exclusively and it is claimed that they are the originators of the three-speed motor countershaft drive for flexible shafts and many useful attachments for several classes of work. Grinding, polishing, buffing, scratch brushing, rotary filing, sanding, drilling, reaming, nut setting, screw driving are some of the operations rapidly and accurately performed by the Strand Flexible Shaft Machines. Send for your copy of Catalog No. 28 today. Address N. A. Strand & Co., 5005 N. Wolcott Ave., Chicago, Ill.

POWER ASSEMBLY TOOLS DATA BOOK—A new 56-page Data Book on Power Assembly Tools, published by Black & Decker in its series of Handbooks, contains a wealth of information, not only on Power Assembly Tools, but valuable information as to sizes of pilot holes; bolt, nut, cap screw and lag screw sizes; socket wrenches and tap drill sizes. The complete line of B&D Power Assembly Tools is described and illustrated. For your copy of Power Assembly Tools Data Book, address Black & Decker Mfg. Co., Towson, Md.

KNIGHT MILLERS—Catalog 12-40T gives features of design and details the many types of precision work done on the three sizes of Knight Multi-Purpose Millers. Balanced design, rigidity, accuracy, accessibility and capacity (16 changes of spindle speed in either direction) are features stressed. Requirements for jig and other precision boring are incorporated in Knight Millers. General specifications, details of construction and accessories including dial indicator equipment, plain index centers, circular table and horizontal milling attachments are shown. For your copy of Knight Millers, Catalog 12-40T, write W. B. Knight Machinery Co., 3918 W. Pine St., St. Louis, Mo.

"10 NEW WAYS TO SAVE TIME AND LABOR WITH HOLDEN HEAT TREATING BATHS"—This attractive booklet lists the different Holden baths for every heat treating function and gives the tempering, hardening, annealing and preheat and speed range for each. The furnaces are illustrated and operating efficiencies given. Four tables give the pot size, furnace dimensions, maximum capacity and applications of the round pot, rectangular pot and electric pot furnaces. This literature is available to executives of tool rooms and die shops. Address the A. F. Holden Co., Dept. TD, New Haven, Conn.

LEWTHWAITE PUNCHES, DIES, BENDERS, CUTTING MACHINES AND SPECIAL TOOLS—Catalog No. 7, distributed by T. H. Lewthwaite Machine Co., 309 E. 47th St., New York, N. Y., describes, gives specifications and prices, and illustrates their complete line of special dies and tools, die holders and punch holders, cutters and punches. A group of Specification Sheets at the back of the Catalog, perforated for easy removal, has sketches of the tool wanted, with size indicated, and a place for quantity desired, name and address. Send for your copy of Catalog No. 7.

"A NEW TAPPING PRINCIPLE"—Bulletin No. 4 describes the Ettco-Emrick method of an adjustable weight-balanced foot treadle, a new principle in foot-operated tappers. The Bulletin features the No. 71 Universal Foot-Operated Vertical Tapping Machine which is equipped with built-in stripper, brush lubricator, work table, provision for speeds from 275 to 2100 rpm. Single and universal double spindle heads as well as special multiple spindle heads are available. For a copy of Ettco-Emrick Bulletin No. 4, write Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.

"PECO TIME SAVING CLAMPS"—This Bulletin announces a new line of quick-acting clamps made by Products Engineering Co. According to the manufacturers, the clamps are designed for application on jigs and fixtures and are adaptable to practically all manufacturing, tooling and fabrication requirements. Diagrams and tables giving catalog number, size and specifications for the quick-action clamp, jig draw clamp and knife clamp are also included. The present line includes quick-acting Drill Clamps, Jig Draw Clamps, Knife Clamps, Toggle Clamps and Jig Cam Clamps. They are constructed of combinations of hot rolled and cold rolled steel, and rivets and rollers are heat treated for strength and long wear. Address Products Engineering Co., Dept. TD, Los Angeles, Calif., for your copy of "Peco Time Saving Clamps".

Hardinge TR Milling Machine

(Continued from Page 47)

The manufacturer lists ten features for the High Speed Precision Milling Machines. These include high spindle speeds that give correct cutting speeds with greater accuracy and better finishes (8 speeds forward—110 to 1850 rpm—and 8 reverse spindle speeds); enclosed column with "Connected Bearing" design; table with working surface of 20¾" x 6" and solid steel overarm.

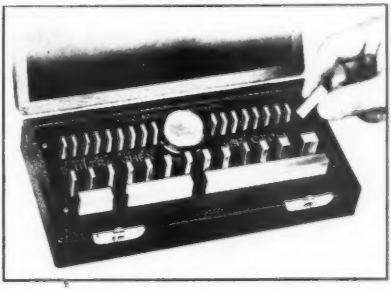
Two models—the TM Hardinge High Speed Precision Milling Machine and the UM Machine—are identical except that the latter has a swivelling table, required for the use of universal spiral index centers. The machine is furnished complete with stops and micrometer indexed feed screws, speed change lever, ball thrust draw spindle and pedestal drive complete with motor and controls.

A new Bulletin "TM and UM Hardinge High Speed Precision Milling Machines" gives full specifications, features and descriptions of attachments. For your copy write Hardinge Brothers, Inc., Elmira, N. Y.

New Ultra-Chex Inspectoset

THE Ultra-Chex Inspectoset, newest addition to the George Scherr Company's line of precision length standards, is now available to tool and die shops.

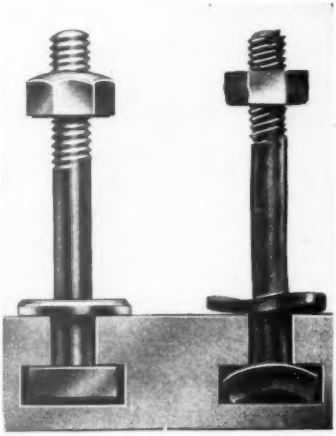
The Inspectoset consists of 34 gage



blocks, which will make up about 80,000 combinations in steps of .0001" from .300" to 8". An optical flat is furnished for checking gage blocks, micrometer anvils and other lapped surfaces for parallelism and planeness.

Write for Catalog on the new Ultra-Chex Inspectoset. Address George Scherr Co., Inc., 128-B Lafayette St., New York, N. Y.

Safeguard the
ACCURACY
of Machine Tools



Use Boyar-Schultz

SMB Tee-Slot Bolts

Bolts of mild steel cannot be expected to stand up under the hard usage of the modern machine shop. They are easily distorted, threads wear and strip, and the heads may soon become so misshapen as to destroy the accuracy of costly machine tools.

SMB BOLTS are made of heat treated chromium molybdenum steel for extra toughness and are also machined for accuracy . . . heads are square with bodies, presenting a flat bearing surface to Tee slot. They hold the job squarely and securely for heavier machine cuts.

Rust resisting finish helps keep threads from binding.

For best results order Nuts and Washers that are MADE for use with SMB BOLTS.

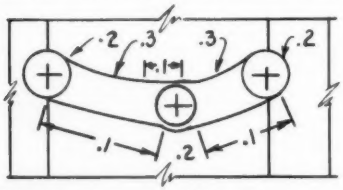
Send For Literature and Prices

BOYAR-SCHULTZ CORPORATION
2112 Walnut St. Chicago, Ill.

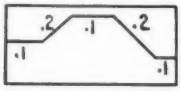
Designing Dies to Reduce Cost

(Continued from Page 26)

sketch ..... 1.5 hrs.



DIES 3 and 4—additional units for each as per sketch .7 hr. or 1.4



PERFORATORS AND PILOTS

PERFORATORS — Two required	.4
PILOT—One required	.2
DIE SHOE—opening	.4
PUNCH HOLDER — opening (pocket in punch holder) ...	.4
	4.3

Inspection

DIES 1, 2, 3 and 4—opening ..	1.5
DIES 3 and 4—opening	1.4
TOLERANCE ± .005 (Table, Fig. 10)	.5
	3.4
TOTAL Column C	7.7 hrs.

MACHINING, FINISHING AND FITTING DIE PARTS

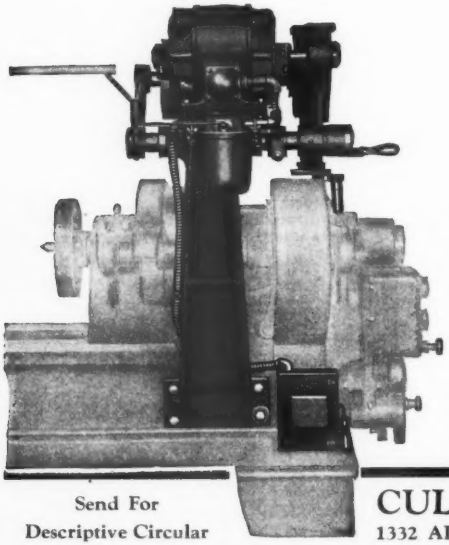
Column D—use contour units as established for Column C, also Drawings and Tables, Figs. 13-20

DIES 1, 2, 3 and 4—as one opening ..... 15 units, size 16, about 3" deep; our table gives values to 1½" deep. We add 50% to maximum by use of 24 hrs. shown for finishing	36.0 hrs. 2.5
Forming radius .2 hr. for each inch 24 x .2	4.8
DIES 3 and 4—7 units, 16 sq. in. x 1" deep. 13.6 hrs. ea...	27.2
PAD—70% of value Table 16 Type 2—15 units, size 16—17 hrs.	

(Continued on Next Page)

MOTORIZE WITH CULLMAN DRIVES

for NATIONAL DEFENSE



Rigidly constructed and easily installed on lathes, shapers, milling machines, punch presses, these drive units are designed to increase machine efficiency 25% or more and still retain belt drive smoothness.

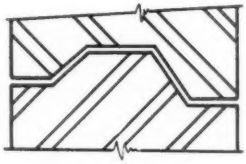
Efficiency of old machinery which has been pressed into service due to Defense demands can be increased to equal that of new equipment. Machines equipped with Cullman Drives require less space and may be arranged to obtain better lighting.

Cullman Drive Units are made in sizes for motors ranging from ¼ to 15 hp.

Send For Descriptive Circular

CULLMAN WHEEL CO.
1332 ALTGELD ST. CHICAGO, ILL.

70% x 17 = 12 hours 12.0
Material removed for difference in height as shown on sketch



7 units, approx. 12 sq. in. x 1" deep each (Fig. 19) 10.4
PUNCH—Type 2, casting 70% 12.0
Material removed for difference in height
7 units, approx. 12 sq. in. x 1" deep each (Fig. 19) ... 10.4
DIE SHOE—4 units, approx. 4" deep. Take the largest value in Table, Fig. 19, plus 20% 12.0
PUNCH HOLDER—pocket 4 units, 6 sq. in. ¾" deep .. 2.4

TOTAL Column D .....129.7 hrs.

PERFORATORS, PILOTS AND THEIR CORRESPONDING HOLES

Column E — see Table and Drawings, Figs. 21-26
PERFORATORS AND PILOT —Type 2 (Fig. 22)
PERFORATORS ..... 1.4 hrs.
PILOT 9
Corresponding holes (Fig. 23) 1.3 each perforator. 2.6
1.3 for pilot 1.3
AIR PINS — allowance estimated 5

TOTAL Column E ..... 6.7 hrs.

ASSEMBLY, TRYOUT, DEVELOPMENT
Column F—see Table, Fig. 28, and accompanying text
DIES 1, 2, 3 and 4—allow 1.0 hrs. for each ..... 4.0 hrs.
PAD 2.5
PUNCH 2.5
RETAINER PLATE 2.0
PERFORATORS AND PILOTS —2 perforators and 1 pilot Allow .5 hr. each 1.5
GAGES—2 gages 1.0 hr. each 2.0
STRIPPER FINGERS—2 required—.5 hr. each 1.0
TRYOUT 15.0

(Continued on Page 52)

Complete Manufacturing Facilities

Over 50,000 Square Feet of Floor Space

TOOLS, DIES — GAGES — JIGS, FIXTURES
SPECIAL MACHINERY — METAL SPECIALTIES
JIG BORING — DESIGN AND DEVELOPMENT

Punch Presses
Kingsbury Drilling Machines
High Speed Tapping Machines
Multislide

Injection Moulding
Spring Winders
High Speed Blanking
Spot Welders
Conveyors

Send prints or sample for prompt estimate

FEDERAL TOOL CORPORATION

400 North Leavitt Street - - - - Chicago, Illinois

Knurled
SOCKET HEAD CAP SCREW

Portrait
of a FAMOUS HEAD

—famous because it's helping to speed up work wherever cap screws are used.

How?

Because the cold-forged Knurled "Unbrako" heads gear right to the fingers . . . there's no slip, no loss of time and the mechanic is pleased because he prefers to use his fingers instead of a wrench.

In addition, the knurling also permits quick and easy locking of the screw after countersinking — a big advantage!

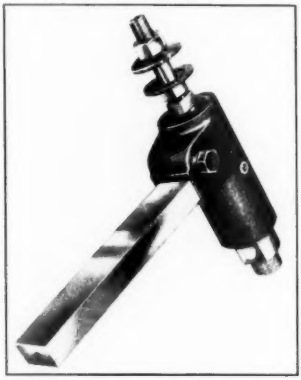
These and other Knurled "Unbrako" advantages are yours at *no extra cost* . . . yours by specifying Knurled "Unbrako" on your next order. Try it.

STANDARD
PRESSED STEEL CO.
JENKINTOWN, PENNA.

Boston
Detroit
Indianapolis
Box 600
Chicago
St. Louis
San Francisco

New Tool Post Attachment

A NEW tool post attachment, manufactured by the Stow Manufacturing Company, Inc., makes lathes adaptable to many different grinding operations, both external and internal. The attachment, driven by a Stow portable flexible shaft machine, accommodates grinding wheels as large as 6" diameter x 1-inch face, and by taking off the clamp spindle and substituting the Stow collet chuck, a variety of mounted wheels and points may be operated for internal grinding and recess surfacing.



The tool end of the tool post attachment is fitted with a combination radial thrust and annular ball bearing. A floating, self-aligning ball bearing is used on the shaft end. This rigid spindle support insures true running of the unit at speeds as high as 6800 rpm.

For further information on this new tool post attachment write Stow Mfg. Co., Inc., Binghamton, N. Y.

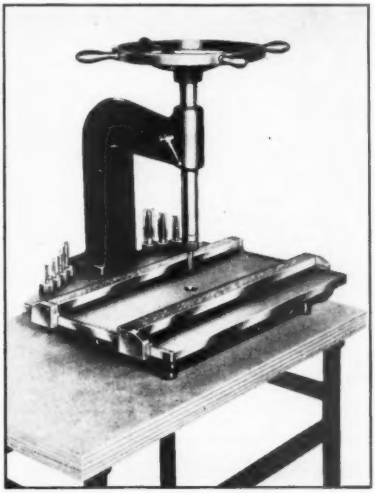
Designing Dies to Reduce Costs

(Continued from Page 51)

DEVELOPMENT of all Bends and Flanges 12.0
DEVELOPMENT — 2 extrusions 2.0 each 4.0

TOTAL Column F ..... 46.5 hrs.
Estimated hours of labor required .....225.7 or 226.0 hrs.
Add 10% Safety Factor to take care of large, heavy die pieces, our estimate is 249 or 250 hrs.

THE VIKING
REG. TRADE MARK
TAPPER



A PRECISION BUILT TOOL

Base, semi-steel casting, well ribbed and seasoned to prevent warping.
Two sliding parallel bars to hold work in place while tapping.
Quick changing adaptors, requiring but 5 seconds to change tap.
Steel spindle hardened, ground and lapped to a perfect gage fit.
Spindle lock for holding spindle in position.
Two spindle bearing bushings hardened, ground and lapped.
Aluminum handwheel with four inserted steel handles.
Bracket arm, semi-steel casting bottom scraped to insure spindle is perfectly square with base.

Send for Circular

THE VIKING TOOL & MACHINE CORP.
6 Main St. Belleville, N. J.

Increase your "Fileage"

Comparative tests prove that American Swiss Files give greater "fileage." One survey made among file users showed that American Swiss files last 25% to 50% longer than others, and many concerns have written us that these files produce better results at lower cost.

Buy from our Distributor
Only the Best are good enough

Look for this trade mark on every tang. Over 3000 different types, sizes and cuts.

American Swiss File & Tool Co.
ELIZABETH, N. J.

AMERICAN SWISS
SWISS-PATTERN FILES

New Majestic Internal Grinding Machine

Designed to meet the requirements of most tool room internal grinding operations.

Equipped with Parker spindle and motor. The nose of the hollow spindle is ground for use of collets—with outside threaded for adaptors and a face plate. Parker ball bearings and standard rotor and stator assure perfect balance for smooth spindle movement. Parker spindle is available in several sizes.

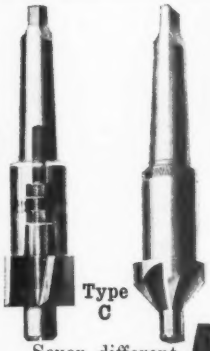
Work head is readily adjustable, with graduated base which swivels 90 degrees on each side of center for taper grinding. A three step V-belt pulley drives an intermediate three step pulley on adjustable countershaft, which, in turn, has a V-belt drive to the main spindle.

The Majestic Internal Grinder is furnished with two section type table, mounted diamond dresser, and coolant tank designed for filtering and equipped with a ⅛ HP motor driven centrifugal pump.

Write for new descriptive circular.

2946 Woodbridge St., E.
Detroit Michigan

MAJESTIC TOOL & MANUFACTURING CO.

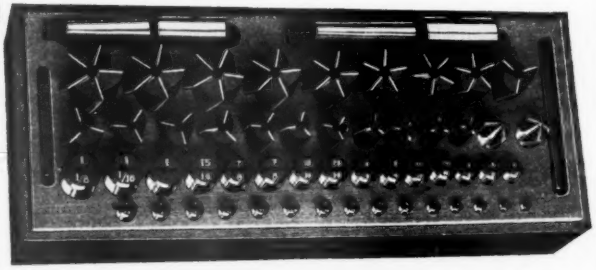


Type C

GAIRING Counterbore Sets

save time— speed production!

Keep a kit of these accurate, efficient tools at hand and eliminate costly delays in counterboring and spotfacing operations.



Seven different sets to choose from, with assorted counterbores, pilots and holders. Write for circular and prices.

THE GAIRING TOOL CO.
Detroit, Michigan

Buy With Confidence

- This directory of products lists for ready reference the names of manufacturers and dealers whose sales to The TOOL and DIE Journal readers have established them as dependable in every sense of the word. They merit your consideration.
- Complete information about any product may be had upon request made to the firm listed or to us.
- Your mention of The TOOL and DIE Journal will be appreciated.

ABRASIVE PAPER AND CLOTH
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass. (Behr-Manning Div.)

ASSEMBLING MACHINES—Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

BAND SAWS—Metal Cutting
Starrett Company, L. S., Athol, Mass.

BAR STOCK—Heat Treating
Lakeside Steel Improvement Co., 5413 Lakeside Ave., Cleveland, Ohio.

BARS—Rolled Composite
Forging and Casting Corp., Ferndale (Detroit), Michigan.

BENCHES
Challenge Machinery Co., Grand Haven, Mich.

BENDERS
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

BLOWERS
Johnson Gas Appliance Company, 611 E Avenue, NW, Cedar Rapids, Iowa.

BOLTS—Stripper
Allen Mfg. Co., Hartford, Conn.
Holo-Krome Screw Corp., Hartford, Conn.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

BORING HEADS—Offset
Precision Tool Co., The, P. O. Box 155, Brooklyn, N. Y.

BRAKES
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

BROACHING MACHINES
American Broach & Machine Co., Ann Arbor, Mich.

BROACHING PRESSES—Standard and Utility
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BURNERS—Gas
Johnson Gas Appliance Company, 611 E Avenue, NW, Cedar Rapids, Iowa.

BUSHINGS—Die
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

BUSHINGS—Drill
Universal Engineering Co., Frankenmuth, Mich.

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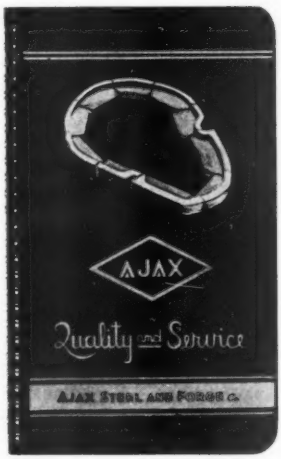

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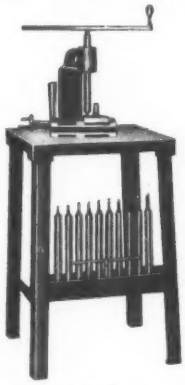

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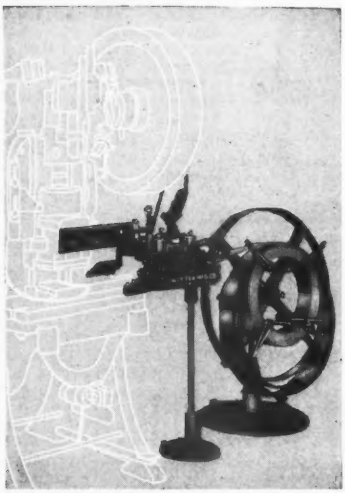

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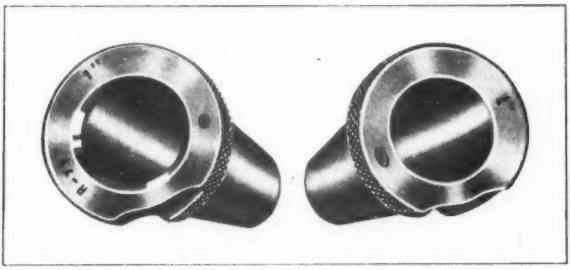

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STEEL PLATE—Rough or Machined Torch Cut Shapes
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

STEEL TREATING—Hardening
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio.

SURFACE PLATES
Busch Company, J. C., 172 S. Ferry St., Milwaukee, Wis.
Challenge Machinery Co., Grand Haven, Mich.
Delta Mfg. Co., 640 E. Vienna Ave., Milwaukee, Wis.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TAP EXTRACTOR
The Walton Co., 88 Allyn St., Hartford, Conn.

TAPPER—Precision
The Viking Tool & Machine Corp., 6 Main St., Belleville, N. J.

TOOL CHESTS
Gerstner Tool Chests, 56 Columbia St., Dayton, Ohio.

TOOL STEEL
Jessop Steel Co., 610 Green St., Washington, Pa.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

TOOLS AND DIES—Carboloy
Kiffer Tool & Die Co., 5601 Tillman Ave., Cleveland, Ohio.

TOOLS—Carbide Tipped
Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich.

TOOLS—Flexible Shaft
Foredom Electric Company, Dept. 226, 27 Park Place, New York, N. Y.
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

TOOLS—Precision, Diemakers
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

TORCHES—Hand Gas
Johnson Gas Appliance Company, 611 E Avenue, NW, Cedar Rapids, Iowa.

ALLENS

pack the strength *with accuracy* for close-tolerance work

For accurate locating of work and rigid retention of assemblies, Diemakers specify "ALLENS",—the *complete* line of Hexagon Hole Products and Diemakers' Accessories, 30 years in the making by *Specialists.*

The Hollow Screws are made from ALLENOY steel, heat-treated, instrument-tested for each physical property, and individually hand inspected. Thread-accuracy has been brought to perfection with Allen-developed lead screw threading machines and the new "Duo-process". Sockets are true and clean. Heads always concentric with screw bodies.

The Dowel Pins (like the Hollow Screws) are made from ALLENOY steel, ground to close tolerance limits, with tensile strength of 240,000 to 250,000 lbs. per square inch.

Full technical data in Folder GT-21,—mailed to you on request.

Call your local Allen Distributor for free samples and service.

THE ALLEN MANUFACTURING COMPANY
HARTFORD, CONNECTICUT, U. S. A.

TUBING—Tool Steel
Bissett Steel Co., The., 947 E. 67th St., Cleveland, Ohio.
TYPE HOLDER
AcromarK Company, The, 261 North Broad St., Elizabeth, N. J.
VISES
Mohr Lino-Saw Co., 130 N. Union St., Chicago, Ill.
Producto Machine Co., The, 990 Housatonic Ave., Bridgeport, Conn.
WELDING
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
WELDING PLIERS
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.
WELDING RODS
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.
WHEELS—Mounted
Chicago Wheel and Mfg. Co., 1101 W. Monroe St., Dept. TD, Chicago, Ill.
WRENCH SETS
Allen Mfg. Co., Hartford, Conn.

New Composite Steel Blanks Conserve Strategic Tungsten

THE steadily increasing demands for vital materials from industries engaged in Defense tooling and production have inspired widespread, intensive research into effective means for conserving strategically important tungsten.

A commendable step in this direction is revealed in the current announcement by The Forging and Casting Corporation, Ferndale (Detroit), Michigan, of a new line of electrically welded composite steel blanks for the making of dovetail forming cutters for use on automatic screw machines.

The blanks are made by electrically welding, by a special process, a cutting face of high speed steel to a non-hardenable base of mild steel, thus reducing by at least one-half the quantity of high speed steel required for a tool of a given size.

According to the manufacturer, the bond between the high speed steel cutting face and the soft steel base is inseparable; and, unlike some methods of alloy conservation which involve principally the use of substitutes, these composite steel blanks offer distinct advantages of their own over the usual solid high speed steel construction that they replace. Important among these advantages is the fact that the non-hardenable tough base *minimizes* the inherent tendency of solid high speed steel tools, during heat treating or because of excessive strain when working, to break out at the sharp dovetail corners or at the screw holes where the tools are attached to the holding fixture.

Bulletin TD8 is ready. Write The Forging and Casting Corp., Ferndale (Detroit), Mich., for your copy.

We have always Specialized in the Design and Building of

Precision Gages and Dies

Fine Gage and Die Makers

Our organization has been trained for years in the exacting art of fine gage and die making.

Our facilities are among the best. Some of the largest users of precision gages, gaging fixtures and stamping dies have been our regular customers year after year.

We are again expanding our capacity to give the same standard of service to a larger number of companies, particularly those engaged in National Defense work.

TOOLS & GAGES, INC.
3106 E. 63rd St. Cleveland, Ohio

May we quote on your requirements?

TANNEWITZ *High Speed*
METAL CUTTING BAND SAWS

Fastest and best known means of cutting sheet steel, aluminum and magnesium sprues, gates, risers and kindred items. Provides saw blade travel of over 2 miles per minute with perfect safety. Cuts are exceptionally smooth. Labor savings ranging from 25% to 90% are the usual thing.

For complete details simply write for bulletin on metal cutting band saws.

Built by Sawing Machinery Specialists

THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN

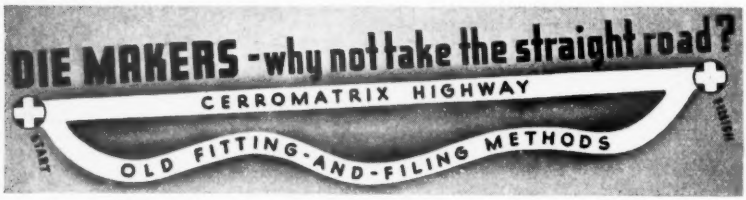
Bokum Introduces New Spotfacer and Boring Tool

THE B & B Spotfacer and Boring Tool, a new product manufactured by the Bokum Tool Company, Detroit, Michigan, introduces new methods of spotfacing and boring. In addition to performing a wide variety of operations it is claimed that many extra tools usually required to do certain jobs can be eliminated. More accurate work can be produced with fewer motions in much less time. Heavier cuts can be made in shorter time.

The tool consists of a head, or bar, with a cutting blade running through a slot at the end of it at right angles. Located on the head is a dial with micrometer readings which enable the operator to set and lock the blade securely to precise diameter measurements within ten-thousandths of an inch.

The B & B Spotfacer is made in three models with standard blades providing a range of boring diameters up to twenty-two inches. A wide range of spotfacing is also offered. With the aid of

(Continued on Page 64)



America needs dies and tools fast for its tremendous national defense program. This, therefore, is no time for slow, out-of-date methods of production.

CERROMATRIX, the low-temperature-melting bismuth alloy that expands slightly on solidifying, offers die makers a sure method of cutting many hours — yes, even days, from the time required to make dies the old way. This remarkable alloy secures punch and die parts swiftly, accurately and rigidly. Why use a detour, when a straight, paved highway lies before you?

SEND FOR FREE MANUAL

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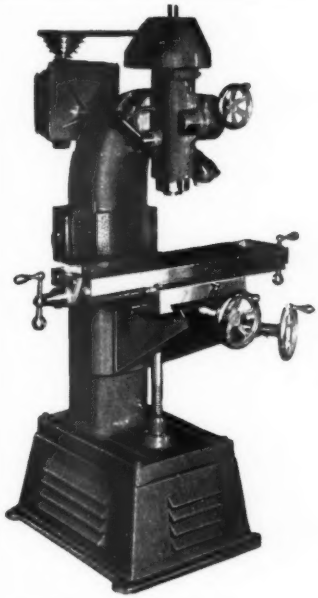
BRITISH ASSOCIATES: MINING & CHEMICAL PRODUCTS LTD., LONDON • CANADIAN DISTRIBUTORS: DOMINION MERCHANTS LTD., MONTREAL



Our Prompt Deliveries are Helping to Speed the

DEFENSE PROGRAM

Jackson Vertical and Horizontal High Speed

Milling Machines

A new plant with increased facilities has made it possible for us to accept a limited number of orders for prompt shipment. High Grade in every respect and especially designed for High Speed Precision and Production Milling and Boring.

Wire, Phone or Write Sales Division

Jackson Machine & Tool Co.

956 Roberts St., Jackson, Mich.

SCHERR COMPARITOL-INSPECTOSET UNIT

Here is an inspection unit that belongs in every shop producing work to close limits. The COMPARITOL is graduated to read to .0001" plus and minus .002". The ULTRA-CHEX Inspectoset consists of 34 gauge blocks which will produce thousands of combinations in steps of 1/10000" from .300" to 8".

By setting the COMPARITOL with an INSPECTO-SET combination you can check all shop gauges, mass produced parts, pins, ball bearings and other articles. ANY SHOP, LARGE OR SMALL, CAN AFFORD THIS COMBINATION UNIT. Write for literature, quotation and delivery dates.

WRITE FOR BULLETIN

DOING CONTRACT WORK?

Eliminate chance of rejection by inspecting your work with the COMPARITOL-INSPECTOSET Unit. Eliminate "Human Uncertainties" in Checking and Inspecting with the Scherr Comparitol.

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Stand for Quality

We were the Originators of HIGH CARBON-HIGH CHROME Steels with NON-DEFORMING Qualities, opening the way to

Quantity Production
with all kinds of Dies and Press Tools

Oil-Hardening
"NEOR"

Air-Hardening
"COBALTCROM-PRK"
—the latter also in CAST FORM

have become the STANDARD on which all subsequent similar kinds of Steel were based.

We supply also

High Speed Steels

in Bars, Forgings, Tool-Bits as well as all types of

High Grade Tool Steels

Write for descriptive Circulars

WELDING RODS
Save time and money in die repair or tool redesigning as used in Precision-Welding.

Full particulars on request

DARWIN & MILNER, Inc.

1260-64 W. 4th St. Cleveland, O.

Spotfacer and Boring Tool

(Continued from Page 62)

a standard small tool adapter the same tool can be used to bore holes as small as a quarter-inch in diameter. Exact diameters can be bored and bottoms faced perfectly square and flat.

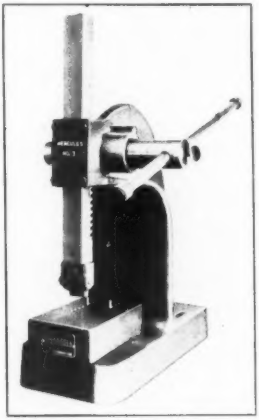
By using blades with step formation, many different diameters may be bored; and steps, or shoulders, may be faced at the same time.

In addition to conventional boring, this new tool shows many advantages in boring long holes in either forward or inverted directions. Instead of building special length bars for tail stock support, a tool room or die shop man can now employ another adaptation of the same tool for this work—the B & B Line Borer. This tool, however, has a tapered shank at both ends. In use, one end is placed in the spindle in the conventional manner and the other end, forming the support, is placed in a tapered end of a plain shaft. This latter may extend beyond the work to reach any bearing support. The tool also permits the bar itself to provide the front pilot. Thus a great saving of time and money is achieved.

For complete information ask for "Cut Spotfacing and Boring Time in Half", Catalog No. 341. Address Bokum Tool Co., 49 W. Hancock St., Detroit, Mich.

New Hercules Arbor Press Outfit Announced by AcromarK

A new complete stamping outfit for stamping numbers into Defense parts,



name plates, tool checks, workmen's badges, metal or fibre identification tags,

(Continued on Page 68)

Dies - Tools - Jigs - Fixtures - Special Machines - Gages - Aircraft Parts

A Note of Appreciation

The volume of business that both new and old customers have given us in the last year has enabled us to increase the floor space in our shop 50 percent. A balanced number of new pieces of equipment manned by carefully selected men makes it possible for us to give better service without sacrificing the high character of our work. Also, naturally, we can do more jobs than before.

At present we have facilities open for die, jig, fixture and gage work, aircraft parts and lathe work.

Deliveries to meet special demands.

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9320 WOODLAND AVE. CLEVELAND, OHIO

WHY WAIT FOR DIES?

Make small runs of many kinds of metal pieces quicker—easier—cheaper—with Micro Die Substitute Machines (Bender, Brake, Shear). Get the work out—save money, too! We illustrate the latest model

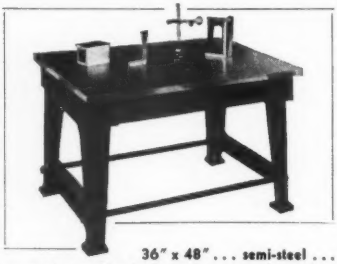
"MICRO DIE DUPLICATING BENDER No. 1"

A right and left hand operating unit for either right or left hand operation. Two-way direction eliminates conflicting material end when forming. 2½ times greater bearing capacity.

Write for circular "Metal Duplicating without Dies."

O'NEIL-IRWIN MFG. CO., 315 8th Ave. So. Minneapolis, Minn.

MILWAUKEE SURFACE PLATES



36" x 48" . . . semi-steel . . . accurately machined. Securely mounted cast legs are machined and provided with adjusting screws for perfect alignment. Shipping weight, 1250 lbs. Also larger or smaller plates with planed or scraped surface.

Write for details.

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Engineers and Machinists Since 1907

172 SO. FERRY ST., MILWAUKEE, WIS.

Walker-Turner Announces Low-Cost Radial Drill

A NEW Radial Drill announced by the manufacturer as the first low-cost radial drill for performing light duty operations is the latest tool to be offered by Walker-Turner Co., Inc., Plainfield, N. J.

The W-T Radial Drill is proving very popular because of its versatility. Tapping, routing and light profiling as well as drilling operations are performed speedily and accurately. Many shops are finding the unit of particular value because of the large capacity of the drill, drilling to the center of a 62" circle. Tool rooms and die shops find the W-T Radial very easy to use for drilling in jigs and fixtures. The unit is finding ready acceptance in a wide number of metal working shops on a great variety of operations.

Design and construction of this new W-T Radial Drill provide for accuracy and ease of operation as well as versatility. The drill head is mounted on a

(Continued on Next Page)

Equip your shop WITH **CHALLENGE** SEMI-STEEL **BENCH PLATES** *at Low Cost*

12x18" Size . . . ONLY— **$14**

Five other sizes.

SMOOTH, ACCURATE SURFACE

For layout, inspection, and assembly. Built of the best iron and steel with top, bottom, and all four sides carefully planed. Plate is 2-inches thick. Under side has heavy ribs. Write for data; also FREE CATALOG and prices on 4-inch Bench Plates, and 6-inch Layout Surface Plates, Lapping Plates, and other Challenge equipment.

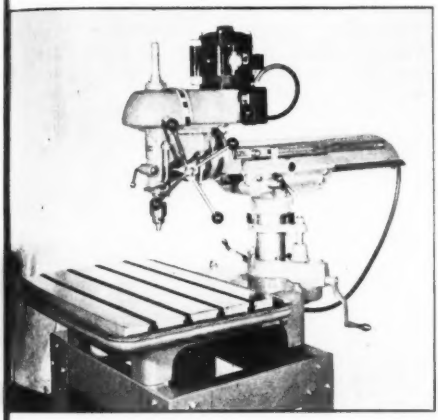
THE CHALLENGE MACHINERY CO.

GRAND HAVEN, MICH.

heavy cast iron ram which rides back and forth in a supporting "cradle" on eight precision ball bearings, permitting rapid movement, forward or back, and reducing lost motion to a minimum. The ram can be quickly locked in any desired position with a quarter turn of the conveniently located clamp lock.

The drill head, ram and cradle swing easily right and left on a machine collar mounted on the top of the raising and lowering column. The drill head, ram and cradle are raised and lowered by a crank-operated screw mechanism mounted on the side of the supporting column. A clamp lock is provided here also.

In spite of the demand to date, good deliveries can be made on W-T Radials equipped with standard single phase



motor. A wide variety of motors including 2-speed to provide spindle speeds for every requirement is available.

For new circular "Walker-Turner Radial Drill' which gives specifications including complete motor data, set-up and application suggestions will be sent on request. Write Walker-Turner Co., Inc., 604 Berckman St., Plainfield, N. J.

Switzerland Delivers the Goods

The safe arrival at New York in May of a Swiss-chartered ship with a huge shipment of Grobet Swiss Files and additional shipments in June and July on American ships assure an immediate source of supply for these precision files. According to E. A. Grobet, president of Grobet File Corp. of America, New York City, further shipments are also expected in the near future, so that complete service to American users of Grobet Swiss Files will continue without interruption.

ANNOUNCING

THE ACCURATE NEW

UNIVERSAL CENTERING

CHUCK...

The New Universal centering chuck converts a drill press into a centering machine. Furnished with a set of bushings and collets for various size center drilling. Accurate and sturdy. Depth adjustment for centers. Write for catalog and prices.

UNIVERSAL

ENGINEERING COMPANY

FRANKENMUTH · MICHIGAN

ALLOY
HY-TEN
STEELS

Immediate Shipment from Seven Warehouses

ALLOY
S. A. E.
STEELS

Reduce your tool and die costs with *Hy-ten "M" Temper, .70 Carbon Cr-Ni-Moly* oil hardening alloy steel. Extreme toughness at high degrees of hardness. Rounds, squares and flats in stock. Forgings of all types.

Send for descriptive folder

CHICAGO **WHEELOCK, LOVEJOY & CO., INC.** DETROIT
CAMBRIDGE CLEVELAND NEWARK CINCINNATI BUFFALO

CUTS TOOLING TIME
SPEEDS PRODUCTION

$29.75

THE UNIVERSAL VISE

Loads and unloads with amazing speed—lever locks work instantly—holds securely—releases quickly. No complicated adjustments—no costly drill fixtures needed—just an inexpensive drill bushing plate and adaptor for each job. Sturdily constructed—nothing to get out of order. Quickly pays for itself. Only $29.75 f. o. b. Chicago. Ten Days Free Inspection

Order Today **MOHR LINO-SAW CO.**
130 N. Union Street, Chicago

Hercules Arbor Press Outfit

(Continued from Page 65)

gears and innumerable other items is offered by The AcromarK Corp.

This outfit consists of a precision constructed Arbor Press having a square ram to insure straight up and down movement. Ram is fitted with a press style Hercules Type Holder, holding any number of pieces of interchangeable type up to the capacity of the press, which is 50 to 1. The stamping block is cast iron, machined and finished smooth and parallel with the face of the type. Guide pins may be placed in proper position for locating the mark on the part.

The manufacturer, The AcromarK Corp., 261 N. Broad St., Elizabeth, N. J., states that several of these outfits are immediately available for delivery to Defense plants. Specify Hercules No. 3 Arbor Press Outfit and indicate size, number of characters and material to be stamped. Descriptive circulars will be mailed immediately upon request.

SHARPLY DEFINED *Scribed Lines*

Micro *Supreme*
LAY-OUT DYE
Manufactured by
MICHIGAN CHROME & CHEMICAL CO.
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Be Sure to Take Advantage of This Special
TRIAL OFFER
A handy five-ounce Combination Brush-in Can . . . ideal for shop use and for trial purposes . . . for only
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Columbia TOOL STEEL

MOLITE - 5

A molybdenum type high speed steel.

Carbon	.80%
Chromium	4.00%
Tungsten	5.00%
Molybdenum	5.00%
Vanadium	1.50%

The all-purpose, heavy duty alternate for 18-4-1.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE PRESIDENT
610 EAST 14TH STREET - CHICAGO HEIGHTS, ILL.

ARMSTRONG

LATHE DOGS

ARMSTRONG Lathe and Milling Machine Dogs are drop-forged from tough open hearth steel, are heat treated to unusual stiffness. Each is in reality 2 tools in 1 for hubs are large enough to permit re-tapping.

11 types each in from 6 to 14 sizes with Square Head, Headless or Safety alloy steel Screws hardened at the point to prevent upsetting.
Write for Catalog C-39

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"The Tool Holder People"
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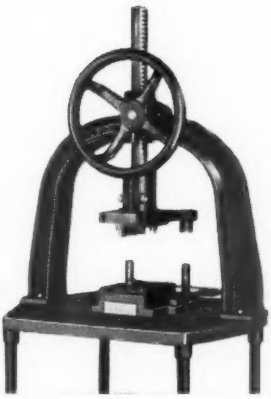
Eastern Warehouse & Sales:
199 Lafayette St., New York



Lacey
DIE SET MACHINE

A handy, movable and powerful tool for aligning and fitting punches to dies, quickly and efficiently. Punches and dies are always properly aligned and are, therefore, easy to separate without use of pry-bars or hammers, hence without danger of mutilation.

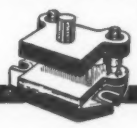
Large hand-wheel facilitates sensitive, yet forceful fitting and makes it possible for the toolmaker to shear-in certain types of dies. A safety stop is provided for any position of the ram; equipped with casters, the machine can be moved about freely and used next to toolmaker's bench.

MARBURG BROTHERS, Inc.
88-92 West Street New York

INTERCHANGEABLE BECAUSE
- Precision bored on master plates
- Precision assembled with cylinder squares

WRITE FOR CATALOG

DANNEMAN *Precision* DIE-SETS



F. C. DANNEMAN COMPANY 203 LAFAYETTE ST., NEW YORK, N. Y.

Remove
BROKEN TAPS

Quickly
Insert WALTON Tap Extractor and back out broken piece. No annealing—no drilling.

Easily
Tap Extractor and Tap Wrench are only tools needed.

Safely
Threads are not damaged. Not necessary to tap oversize after broken tap is removed.

Write for Folder 132

THE WALTON CO.
88 Allyn Street Hartford, Conn.

MARKING SPECIALISTS
CAN SHOW YOU THE
QUICK
WAY TO MARK DEFENSE PARTS WITH NUMBERING, LETTERING AND DESIGN.

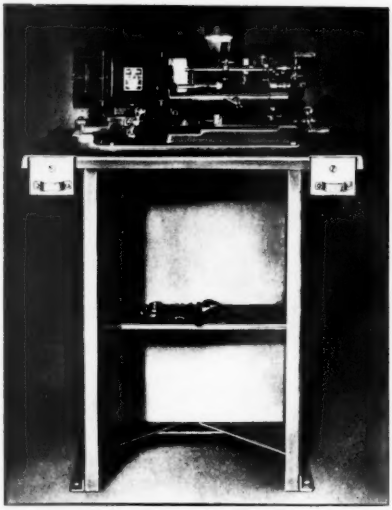
MARKING MACHINES, NUMBERING MACHINES, STEEL LETTERS & FIGURES CARRIED IN STOCK OR MADE TO ORDER.

SEND YOUR MARKING PROBLEM AND ASK FOR CATALOG.

The AcromarK Corporation
261 North Broad St. Elizabeth, N. J.

Blake Announces Two New J-B Tap Grinders

THE Edward Blake Company announce the new No. 1 and No. 2 J-B Tap Grinders and a new J-B Tap Grinder Knee-Room Pedestal. These machines are designed for sharpening taps on the chamfer. Because of positive mechanical controls that assure grinding of



uniform relief on the chamfer of each land the J-B Tap Grinder should soon pay for itself in regular use.

The new J-B Tap Grinders will sharpen 2-, 3-, 4-, and 5-flute taps and may be equipped for grinding 6-flute taps or 8- and 10-flute taps. Both right and left hand taps may be sharpened.

(Continued on Page 74)

One Man and a "Portelvator"

No shop is completely equipped without it.

Lift and move 2000 to 5000 pound dies, jigs and fixtures easily and safely. This **Hamilton Portable Table** quickly overcomes its cost by eliminating costly mishaps and breakage and in actual time saved. Two standard sizes.

Also Special Sizes Up To 20 Ton Capacity

Write for circular and prices

THE HAMILTON TOOL COMPANY

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GERSTNER CHESTS

When you buy a Gerstner Chest you receive a life-time of helpful service that always pleases. We invite you to examine our Free Catalog.

GERSTNER TOOL CHESTS

56 Columbia St. Dayton, Ohio

HANDY RACKS

Now available in 4-Arm, 51" high or the new 5-Arm-Rack, 57" high. Used wherever flat or round bar stock or tubing is kept—factories, warehouses, schools, large & small shops. Four times the usual capacity for the floor or height space. Low cost, & money or space saved.

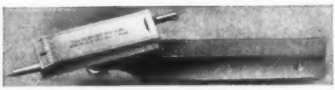
Send for priced circular.

Wm. S. Yohe Supply Co.

507 Gibbs Ave., N. E.

CANTON, OHIO

THE KOCH TEST INDICATOR

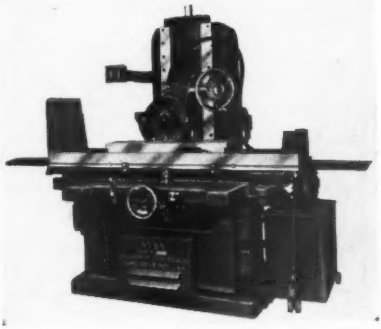


Send for Bulletin T.

— the only Tool Makers' Indicator on the market with Two Working Ends for inside and outside tests. Compression and balance torsion give accuracy to a tool of high magnifying power. Scale of Indicator reads .001" and has 11 lines divided into ¼" space. Shock proof. Attachments of the Indicator broaden its use and fit any gauge on the market with ⅜" spindle. Dealers Wanted.

THE KOCH TEST INDICATOR

28 2nd Ave. Nyack, N. Y.



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Provide for Tool Room Accuracy at Production Speeds Built in Many Sizes

New Bulletin GL-100 on Request

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Designers and Manufacturers of
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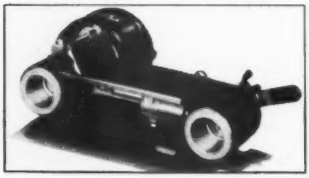

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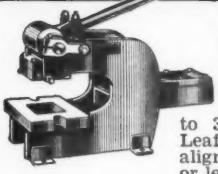

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J-B Tap Grinders

(Continued from Page 70)

The capacity of the No. 1 J-B Tap Grinder is as follows: taps held on O.D. of thread—any length—No. 0-½"; taps held on shanks—any length—No. 0-⅝"; taps held on centers—lengths under 5"—No. 0-2". The No. 2 J-B Tap Grinder is similar to the No. 1 except that it is furnished with a 10" extended bed for sharpening the chamfer on taps up to 12" long held on centers.

Taps may be inserted or removed from the machine in a few seconds, and a simple locating device insures correct positioning and duplication of work. The desired relief is obtained by a simple screw adjustment of an eccentric mechanism. The motor head unit may be swiveled in a wide arc on any desired chamfer angle.

The machines are accurately and ruggedly built, and rapid and positive in operation, requiring little or no special operating training. They are profitable shop tools because substantial savings can be made by sharpening and resharpening valuable taps which formerly had to be discarded.

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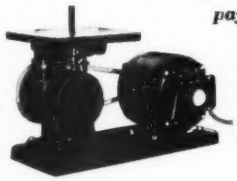
pays for itself.



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A GOOD MECHANIC SELDOM GETS HURT—This pocket size, Wire-O bound, 94-page book is a collection of Safety Joe Talks on sound safety precautions for each machine tool in the shop. Written by Herman R. Graman, Machine Shop Instructor and Assistant Supervisor of National Defense Training at Parker Vocational High School, Dayton, Ohio, after years of experience and experiment, the book is a valuable contribution to shop safety. The style is friendly and human, adding to its interest for both students and apprentices. The well-chosen group of 34 shop photographs illustrate both what-to-do as well as what-not-to-do.

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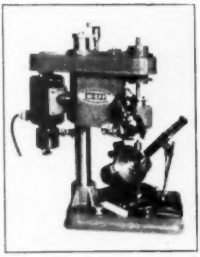

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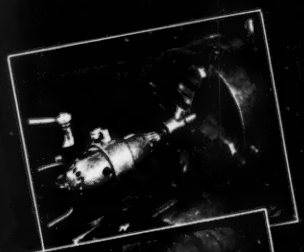

Illustrated is Duro's Heavy Duty Grinder, being used as a tool post grinder. The udaptor holds grinder. Easily adjustable to any position for internal and external grinding. Hand grinding and polishing can be easily and rapidly handled. Delicate or heavy work is all the same to this vibrationless tool. A practical grinder for the Tool Room and Die Room, or Production shop. Do more with less effort

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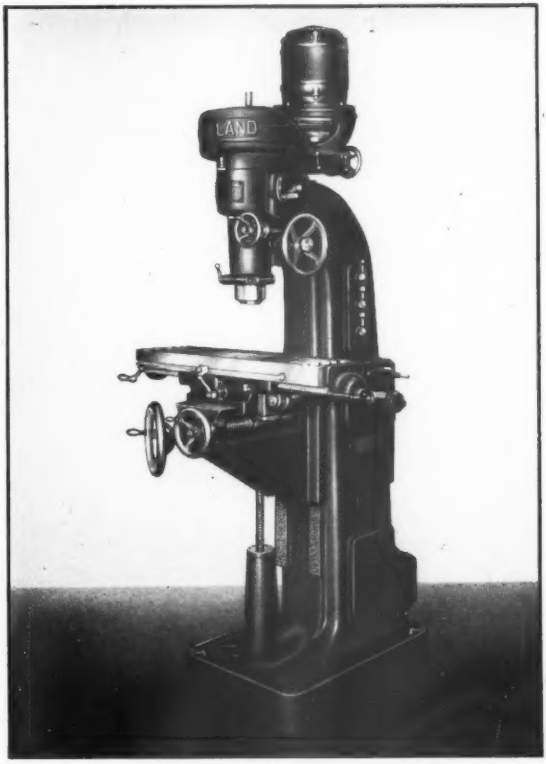

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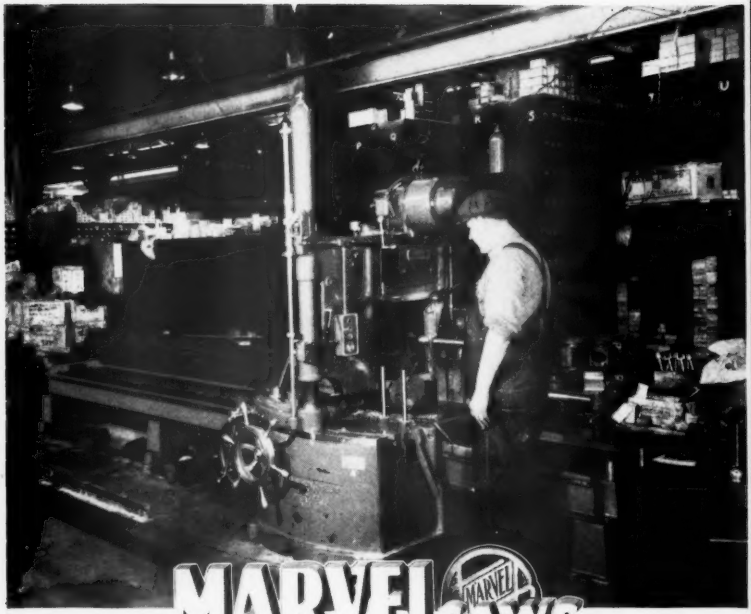

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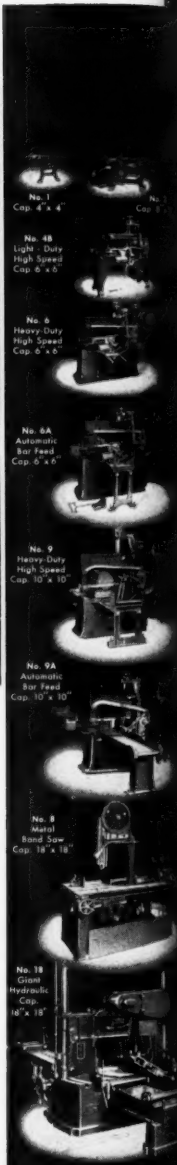

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